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THE NAVAL POSTGRADUATE SCHOOL PUBLIC WORKS DEPARTMENT MAINTENANCE REQUEST PROCESS ANALYSIS

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This thesis analyzes the maintenance request process for the Public Works Department (PWD) at the Naval Postgraduate School (NPS). A flow chart of the maintenance process was developed through interviews with PWD personnel. The PWD's historical database files for FY94 to FY97 provided the data for the analysis. The process flow chart and the data analysis identified areas of inefficiencies and bottlenecks. Methods to relieve the bottlenecks and improve efficiency were identified. Performance metrics were also identified to help the PWD track performance and identify areas where further improvements could be made.

This research found that the PWD can benefit most by improving labor scheduling, material requisitioning and its information technology management system. Additional benefits could materialize from improving the PWD's allocative efficiency (i.e. project priority system).

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THE NAVAL POSTGRADUATE SCHOOL PUBLIC WORKS DEPARTMENT MAINTENANCE REQUEST PROCESS ANALYSIS

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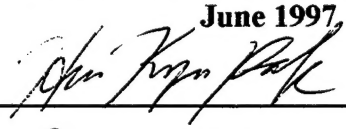
Authors: 

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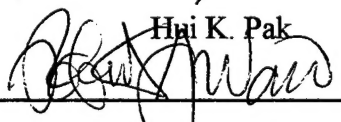

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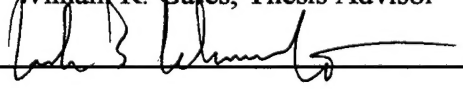

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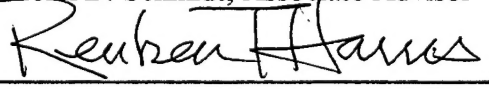

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ABSTRACT

This thesis analyzes the maintenance request process for the Public Works Department (PWD) at the Naval Postgraduate School (NPS). A flow chart of the maintenance process was developed through interviews with PWD personnel. The PWD's historical database files for FY94 to FY97 provided the data for the analysis. The process flow chart and the data analysis identified areas of inefficiencies and bottlenecks. Methods to relieve the bottlenecks and improve efficiency were identified. Performance metrics were also identified to help the PWD track performance and identify areas where further improvements could be made.

This research found that the PWD can benefit most by improving labor scheduling, material requisitioning and its information technology management system. Additional benefits could materialize from improving the PWD's allocative efficiency (i.e. project priority system).

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I. INTRODUCTION

The Department of Defense (DOD) is currently in a state of budgetary decline. In the effort to do more with less, the department has relied more heavily on innovation and non-traditional methods to achieve efficiency and cost reductions. These efforts have affected every area of operations and support within the DOD.

A. BACKGROUND

One organization affected by the drawdown is the Public Works Department (PWD) at the Naval Postgraduate School (NPS). Its responsibilities have increased steadily while the resources have declined over the years. The problem has been exacerbated by the closing of Fort Ord (renamed as the Presidio of Monterey Annex, or POMA) and shifting the maintenance responsibilities of the areas remaining open to the NPS PWD. Added demand for PWD services from the Presidio of Monterey (POM), the Defense Language Institute (DLI) and the La Mesa Family Housing Service Center (FHSC) puts even more strain on the limited resources. As a result, the PWD is faced with an increasing backlog of work requests and dissatisfied customers. In the current climate of general budget decline, it is unlikely that PWD's resources will increase in the near future. Therefore, the PWD has to rely on the efficient application of current resources and process improvements to decrease the backlog and eliminate the perception of an inefficient and ineffective organization.

1. Strategic Policy of Public Organizations

Efficiency and effectiveness in private sector firms are a function of strategic planning. This planning encompasses the overall strategy through which the company pursues its profits. A company will receive immediate feedback on performance by how well the company is able to compete in its environment. This situation is contrasted to a government agency which has no competitors and thus no specific strategy to compete. Public agencies rarely find it necessary to defend their customer service levels except through a formal inquiry. This behavior leads to the common perception of an uncaring bureaucratic machine that seems oblivious to customer satisfaction.

Under fiscal pressure, public organizations were mandated to develop strategic plans for efficient use of resources. Many if not all of the procedures for strategic management currently in use were developed in and for private sector firms. Adapting management practices and procedures from the private sector for the public sector is not new. This long tradition of using the practices that work in the private sector and applying them to the public sector has, in fact, picked up momentum in this era of fiscal restraint. However, Nutt & Backoff (1992) warn "Strategic managers of public organizations should be wary of using private sector approaches that assume clear goals, profit or economic purposes, unlimited authority to act, secret development, limited responsibility for actions, and oversight through market mechanisms that signal financial results." This warning reflects that "many of these assumptions are not valid" for public organizations.

2. Markets

There is no automatic mechanism to ensure efficiency in government organizations because most public organizations lack an economic market that provides them with valuable feedback in the form of revenues. In private organizations, the customer's buying power is the primary source of information, suggesting organizational products that are or are not effective. Public organizations depend on oversight bodies for resources or on reimbursement for services based on preset formulas. Appropriations are often divorced from market mechanisms, allowing public organizations to avoid effectiveness considerations until these questions are raised by the responsible oversight body (Drucker 1973). Budget allocations from these oversight bodies often follow historical precedent, creating incentives for organizations to spend at previous levels whether or not such spending has produced useful outcomes (Dahl and Lindblom, 1953; Ritti and Funkhouser, 1987; Nutt and Backoff 1992).

Data describing service markets are often missing or unobtainable in public organizations. Many public organizations are prohibited from diverting funds from providing service to collecting data on the quality, distribution and other service delivery features. Even in situations in which collecting such information is not prohibited, professionals are often reluctant to divert resources from providing services to collect such data. Public organizations often do not see the need to document performance trends until it is mandated through the responsible budgetary committee.

3. Expectations

Goal ambiguity in public organizations makes performance expectations more difficult to specify (Dahl and Lindblom, 1953; Schultze, 1970; Nutt and Backoff, 1992). Vague performance expectations have several consequences. First, success cannot be easily recognized and it is often difficult to identify and reward key contributors. Also, failure cannot be detected and corrected in a timely manner. There is less urgency in the workers' response to disruptions or changes to the status quo of public organizations. This causes expectations to be in a constant flux and makes it easy to rationalize inaction (Nutt and Backoff, 1992). These factors contribute to the negative perception of bureaucracies as being inefficient and ineffective.

B. OBJECTIVE

The objective of this thesis is to conduct a functional process improvement evaluation of the maintenance request process at the Naval Postgraduate School Public Works Department. This evaluation will identify non-value added steps and time saving methods to improve customer satisfaction. The goal is to improve the PWD's technical efficiency and thereby improve the application of the limited resources allocated to the PWD.

C. SCOPE AND LIMITATIONS

This thesis concentrates on the application of functional process improvements with the existing technology at the PWD. The focus is to examine alternative processes and structures to maximize efficiency of resources at the PWD. Every attempt was taken to assure the accuracy of the report but the following disclaimers apply: the current process, as described, was in existence at the time of the various interviews throughout this project; all steps were verified by the responsible worker(s); and finally, the lack of historical data to support assumptions contained in this report are identified where appropriate.

The primary limitation to this research is the lack of historical data to support the assumptions made throughout this report. The PWD has the technology to collect the data, however, the management does not require accurate data collection nor use the information for process improvements.

D. ORGANIZATION

The first chapter provides background about the relevant issues concerning public and private sector strategies for achieving efficiency and effectiveness. The second chapter defines the two types of economic efficiencies. Chapter III discusses the PWD's work request processing procedure. Chapter IV discusses data analysis. Chapter V identifies and analyzes functional process improvements, and recommends and identifies

and identifies possible savings associated with those options. The final chapter summarizes the report and recommends areas of further research.

II. ECONOMIC EFFICIENCY

The PWD must find a way to be more efficient with its resources due to imposed budget constraints. For this reason, it is important to have a basic understanding of economic efficiency so that a common definition is attained. With this distinction made, it will become clear that there are two types of efficiency and thus two different sets of questions and answers.

A. DEFINITION

This chapter will analyze technical efficiency and allocative efficiency in the PWD's resource allocation. For simplicity, the analysis will begin with two inputs, labor (L) and capital (K), and two outputs, work requests (WR) and chit requests (CR). The analysis will later be expanded to include a third output, reimbursable jobs (RJ), for the various organizations also supported by the Naval Postgraduate School PWD.

Economic efficiency is categorized into two types, technical efficiency and allocative efficiency. Technical efficiency is attained when the level of WR is maximized for a given production of CR, considering current technology and resources. In other words, current resources are employed such that increasing the production of one output (e.g., WR) is impossible without either decreasing the production of other outputs (e.g., CR) or obtaining more resources or better technology. There are many production levels for CR and WR that are technically efficient. Allocative efficiency selects between technically efficient points. Allocative efficiency exists when the mix of WR and CR is

both technically efficient and maximizes the total value (utility) received by PWD's customers. The value of the mix of outputs is determined by the customers. The amount of resources allocated to producing WR and CR determines the mix of outputs.

B. PRODUCTION POSSIBILITIES FRONTIER

The PWD resources include labor and capital. How much WR and CR are produced depends on the resources available and their efficient allocation across outputs. The PWD has limited resources and, therefore, faces a constrained optimization problem. Moreover, PWD wants to achieve technical efficiency by producing the maximum quantity of WR for the given level of CR and available resources. To this end, PWD has to produce any combination of WR and CR along the production possibilities frontier (PPF) (see Figure 2.1).

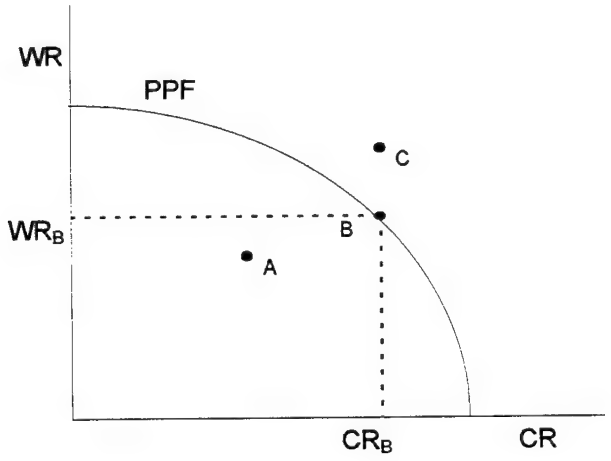

Figure 2.1 PPF curve for WR and CR production.

The PPF shows the alternative combinations of WR and CR that PWD can produce by fully utilizing all the resources at its disposal with the best technology available (Salvatore 1986). Production anywhere inside the PPF curve, as indicated by point A, represents an inefficient use of the resources. Production anywhere outside of the PPF curve, as indicated by point C, is impossible to achieve without more resources or improvements in the current technology. Point B indicates technically efficient utilization of current resources. At point B, the output of CR is maximized given that the output of WR equals WR_B. Alternatively, point B maximizes the output of WR given that the output of CR equals CR_B.

There are infinite combinations of WR and CR along the PPF curve that could be produced by fully utilizing all the available resources. Thus, production anywhere on the PPF would achieve technical efficiency. Choosing where to produce on the PPF, or which combination of WR and CR to produce, involves allocative efficiency.

C. TECHNICAL EFFICIENCY

An isoquant depicts the different combinations of resources that can be used to generate the same level of output (Gould and Lazear 1989). Figure 2.2 depicts a hypothetical mapping of isoquants for the production of WR. The higher isoquant refers to a larger output of WR. Correspondingly, the larger output requires an increase in labor and capital. The slope of the isoquant indicates the rate at which you substitute capital for labor, or vice versa, and keep output constant. The isoquants are negatively sloped to indicate that a reduction in labor requires an increase in capital to produce the same level

of WR. In particular, the slope of the isoquant in Figure 2.2 is $-MB_k/MB_l$ (see Table 2.1 for definition of acronyms). The marginal benefit of labor (capital) represents the change in the output of WR (Δq) as labor (capital) changes by one unit (i.e., $MB_l = \Delta q/\Delta L$, $MB_k = \Delta q/\Delta K$). The ratios of these marginal benefits indicates the rate at which capital and labor can be substituted for one another (i.e., $-MB_k/MB_l = -(\Delta q/\Delta K)/(\Delta q/\Delta L) = -\Delta L/\Delta K$) (Gates Winter 1996). For example, suppose the output of WR increases twice as fast when you add one unit of labor as when you add one unit of capital (i.e., MB_l is twice as large as MB_k or $MB_l = 2MB_k$). For every unit decrease in K, you would have to increase L by one half unit to keep output constant. Thus, the slope of the isoquant would be -1/2 (i.e., $-MB_k/MB_l = -1/2 = -\Delta L/\Delta K$). A similar isoquant map is provided for the production of CR in Figure 2.3.

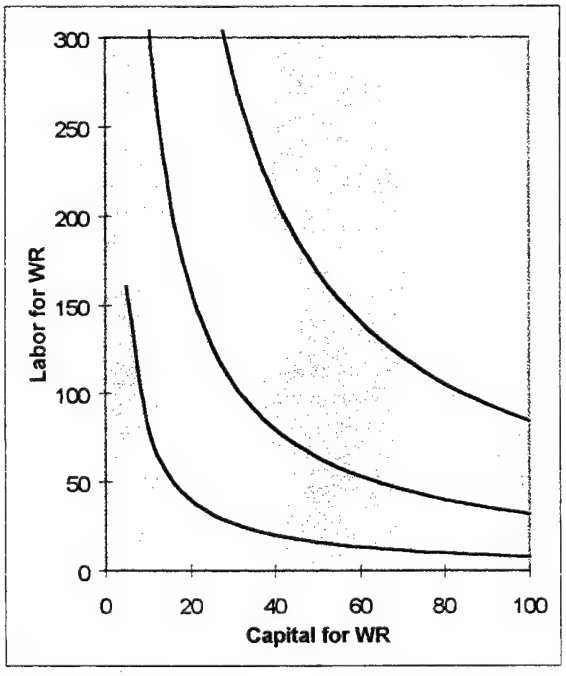

Figure 2.2 Isoquants for WR production (Gates Winter 1996).

MB_l^{WR}	Change in output of WR as labor changes by one unit.
MB_k^{WR}	Change in output of WR as capital changes by one unit.
MB_l^{CR}	Change in output of CR as labor changes by one unit.
MB_k^{CR}	Change in output of CR as capital changes by one unit.
MB_l	Marginal benefit of labor.
MB_k	Marginal benefit of capital.
ΔL	Change in labor.
ΔK	Change in capital
Δq	Change in output (i.e., WR or CR)

Table 2.1 List of acronyms.

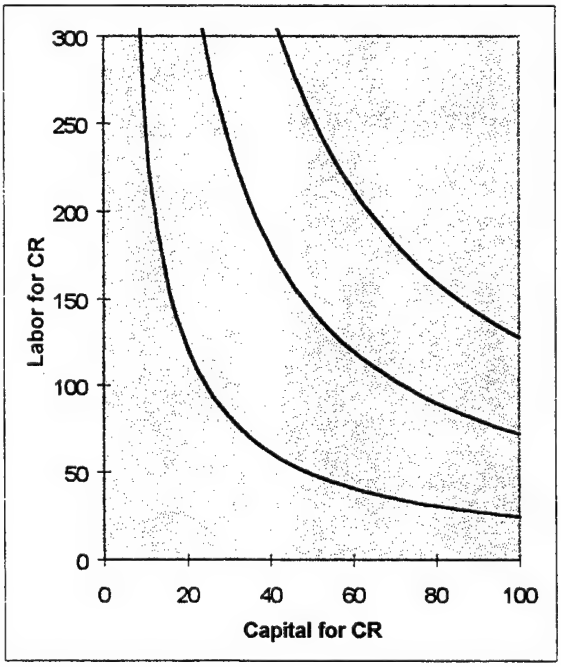

Figure 2.3 Isoquants for CR production (Gates Winter 1996).

Since production of WR and CR must draw from the same labor and capital pools, the analysis has to combine the two outputs to reflect the sharing of the resources. The distribution of the total quantity of resources can be incorporated by combining Figures 2.2 and 2.3. This is accomplished by rotating Figure 2.3 one-hundred-eighty degrees and combining it with Figure 2.2. The result is a single graph called an Edgeworth Box diagram, as shown below (Gould and Lazear 1989). The tangency points between the WR and CR isoquants are known as the Pareto optimal points. There are an infinite number of Pareto optimal points. They are optimal because all the available resources are fully utilized and it is impossible to increase the production of one output without reducing the production of the other. At every tangency point the slopes of the WR and CR

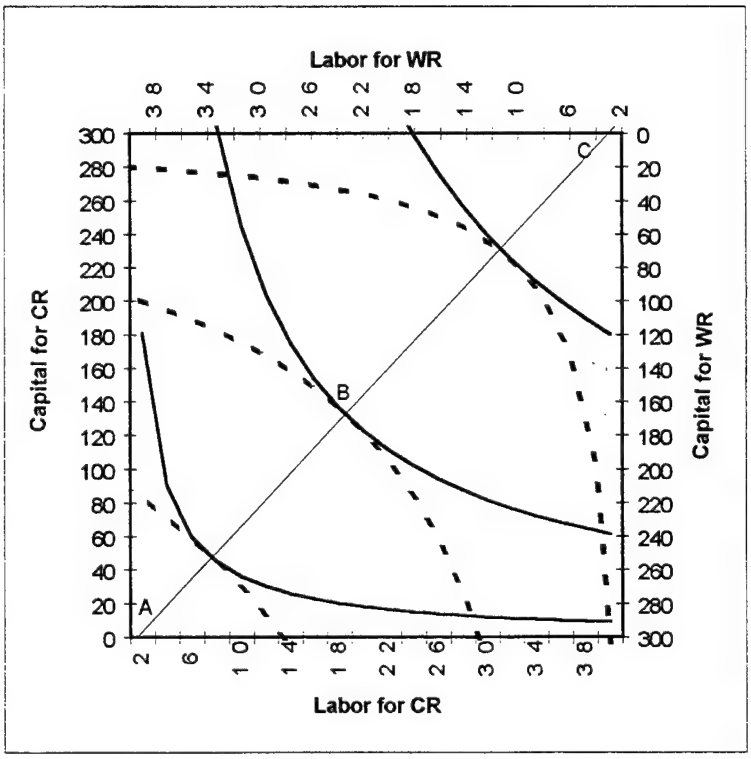

Figure 2.4 Edgeworth Box diagram for WR and CR production.

isoquants are the same. In other words:

$$(-MB_k^{WR}/MB_l^{WR}) = (-MB_k^{CR}/MB_l^{CR}).$$

Rearranging terms, this can be rewritten as:

$$(MB_k^{WR}/MB_k^{CR}) = (MB_l^{WR}/MB_l^{CR}).$$

However, the total pool of capital and labor is fixed. Therefore, if an additional unit of K (L) is used in WR, K (L) must be reduced by one in CR. Thus, the above relationship equates the ratios of the marginal benefits to marginal costs for the capital and labor used in WR. In particular, MB_k^{WR} measures the increase in WR when an additional unit of K is used in WR. To accommodate this increase in K for WR, K for CR must be reduced by one. The impact of this reduction on CR output is measured by MB_k^{CR} (note that when K decreases, the value of MB_k^{CR} is negative). Thus, MB_k^{CR} uses the decrease in CR output to measure the cost of increasing K in WR. This is referred to as the opportunity cost of K in WR. Similarly, MB_l^{WR}/MB_l^{CR} measures the ratio of the marginal benefit and marginal opportunity cost of labor in WR, where the marginal opportunity cost is the reduction in CR output as L decreases by one unit (MB_l^{CR}). When these two ratios are equal, the resource allocation is Pareto optimal (i.e., you cannot increase the output of one item without decreasing the output of the other) (Gates Winter 1996).

To verify that this condition is Pareto optimal, consider a counter example. Suppose that $MB_k^{WR} = 10$, $MB_k^{CR} = 5$, $MB_l^{WR} = 15$, $MB_l^{CR} = 5$. Plugging these values into the above relationship yields : $10/5 \neq 15/5$. In particular, labor is more productive in WR, relative to CR, than is capital. Suppose we transfer 1 unit of labor from CR to WR. WR output increases by 15, CR output decreases by 5. To offset the negative impact on CR output, we can shift capital from WR to CR. We will consider two shifts: one

calculated to keep CR output constant and one calculated to keep WR output constant. The shift in labor decreased CR output by 5 units. To keep CR output constant, we must shift enough capital from WR to CR to increase CR by 5. From above, $MB_k^{CR} = 5$. Thus, we must shift one unit of capital. If we shift one unit of capital, WR output decreases by 10 ($MB_k^{WR} = 10$, from above). Combining the shifts in K and L leaves CR output unchanged but increases WR output by 5 (15-10). Alternatively, you could shift one and one half units of capital from WR to CR. In this case, WR would decrease by 15 ($MB_k^{WR} = 10$), and CR would increase by 7.5 ($MB_k^{CR} = 5$). Combining the shifts in K and L leaves WR unchanged but increases CR by 2.5 (7.5-5) (Gates Winter 1996).

If $(MB_k^{WR}/MB_k^{CR}) > (MB_l^{WR}/MB_l^{CR})$, a similar numerical example would demonstrate that you can increase CR (WR) without decreasing WR (CR) by shifting capital from CR to WR and labor from WR to CR. Finally, if $(MB_k^{WR}/MB_k^{CR}) = (MB_l^{WR}/MB_l^{CR})$, a numerical example would demonstrate that you can not shift either capital or labor and increase the output of WR (CR) without decreasing the output of CR (WR). Therefore, these tangency points are Pareto optimal and represent efficient allocations of capital and labor (Gates Winter 1996).

The locus of isoquant tangencies represented by the line ABC in Figure 2.4 is known as the production contract curve. The production possibility frontier discussed earlier is derived by mapping the production contract curve on a WR-CR coordinate. Thus, each tangency point represents a production combination of WR and CR on the PPF curve and correspondingly, technical efficiency is attained at these output levels.

When a reimbursable job is included in the analysis as a third output, the resources must be shared between the production of WR, CR and RJ. However, since the PWD is

reimbursed for all costs associated with producing RJs, only labor qualifies as a shared input. Thus, PWD splits its capital between production of WR and CR while labor is split between production of WR, CR and RJ. A graphical analysis would reveal a three dimensional Edgeworth box diagram with a third output axis added for the RJ production. Therefore, the graph would include two input variables and three output variables. The Pareto optimality would occur at the tangency points of the WR, CR and RJ isoquants.

D. ALLOCATIVE EFFICIENCY

Allocative efficiency refers to maximizing the value of the PWD services to the customer. The PWD management must decide which Pareto optimal point provides the most benefit to their customers. Determining the proper mix of WR and CR requires a value judgment. Thus, it is difficult to determine. The problem is further complicated by the difficulty of measuring the benefit customers receive from either WR or CR.

The focus of this thesis is not allocative efficiency, but technical efficiency. The objective is to investigate the technical efficiency of the output currently achieved by the PWD. The research will determine whether commercial-off-the-shelf (COTS) scheduling software or other functional process improvements will help improve PWD efficiency in resource allocation and technical efficiency. Further pursuit of allocative efficiency deals primarily with the job prioritization process. This issue is beyond the scope of this research, and is recommended for further research.

III. OVERVIEW OF CURRENT PROCESS

In order for an organization to become efficient, it must first understand the way it currently does business. A thorough understanding of these processes will allow functional process improvement recommendations to be made. This section will describe the PWD process in detail and will help identify areas where improvements can be made.

A. PWD BACKGROUND

The PWD processes two types of maintenance requests, chit size requests and work requests. Both types of maintenance requests are processed on the Work Request Form. CR requests represented 78 percent of the total work performed by the PWD. They are defined as jobs within the capabilities of the PWD that require less than 40 hours of labor, cost less than $5000, and do not require planning and estimating (P/E) (Smith; Gillis). Any request not satisfying this criteria is classified as a WR.

The NPS PWD has historically had a significant number of maintenance requests in process. On average, 1728 requests were outstanding each month during the fiscal year 1996 (FY 96) (Lawrence)(see Figure 3.1). The dramatic reduction in maintenance requests in September 1996 was due to a one time adjustment to the number of requests outstanding. This was accomplished by giving the customers 30 days to reinstate their requests for backlogged work; any request not reinstated was permanently deleted from the system.

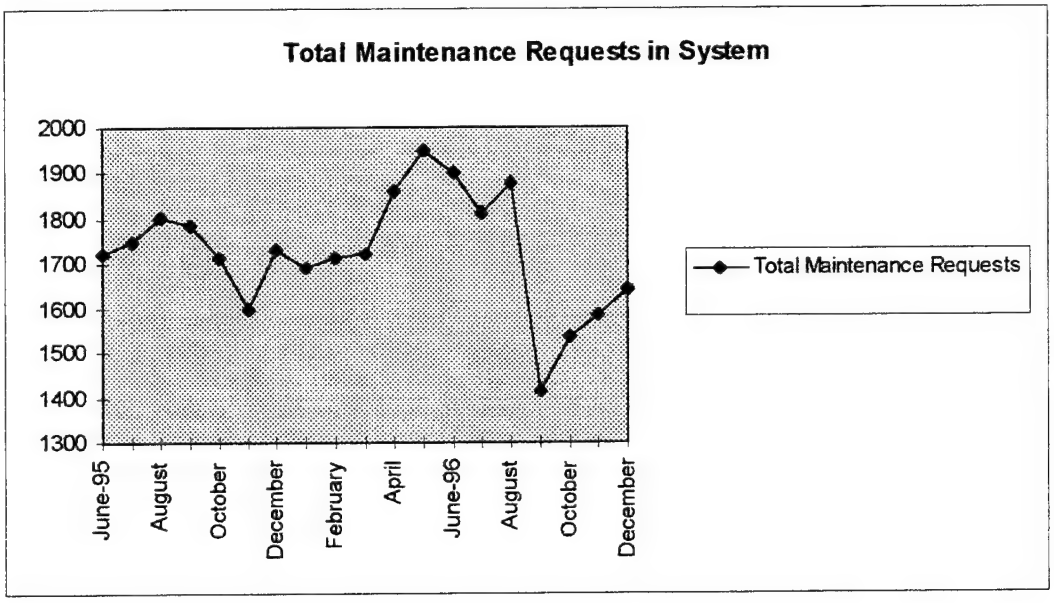

Figure 3.1 June 1995 through December 1996.

The PWD has been unable to significantly close the gap between the incoming WRs and those that are completed. Outstanding WRs were completed at a rate of 232 per month while new requests arrived at a rate of 227 per month. An estimated 2,784 WRs were processed in FY 96. To aggravate the situation, the trend for job completion has been declining in recent years (Lawrence)(see figure 3.2).

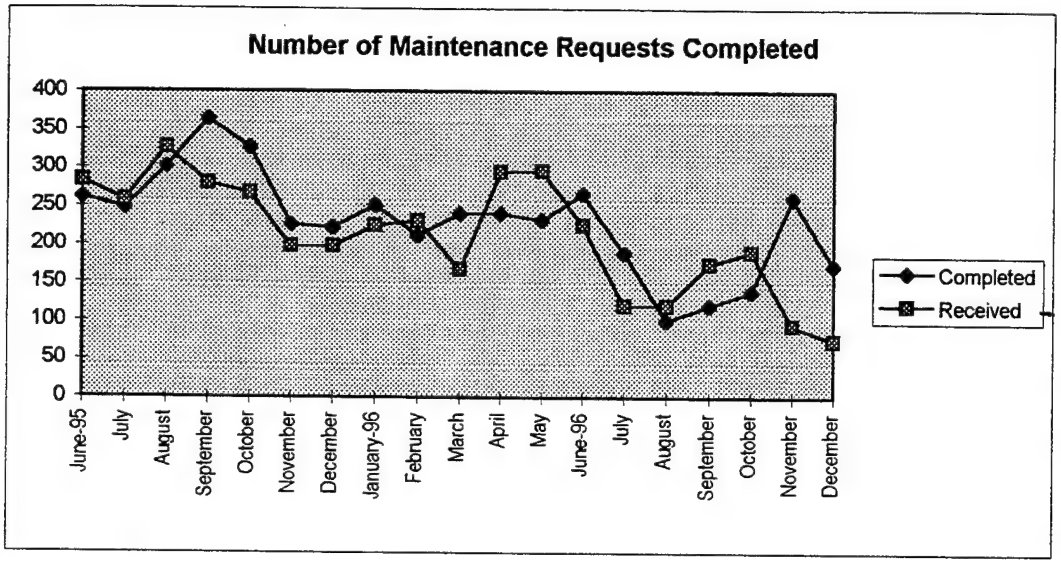

Figure 3.2 June 1995 through December 1996.

Incoming requests are internally classified into three categories based on urgency of need: Priority 1's to be completed in 30 days or less, priority 2's in 90 days or less and priority 3's in one year. The current completion status of each priority now averages 310, 384 and 906 days in the system, respectively (Smith, Lawrence)(See Figure 3.3).

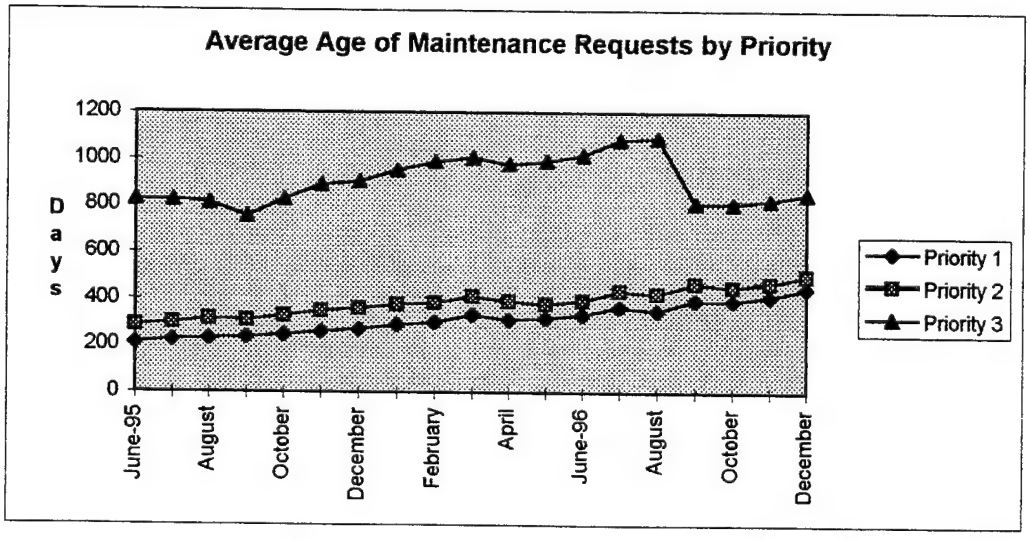

Figure 3.3 June 1995 through December 1996.

A historical lack of timely response by PWD has indirectly caused an artificial inflation of priorities in the both CR and WR work requests. This is borne out by the number of requests that are elevated to the higher priorities. Priority 1, 2 and 3 requests average 617, 449 and 236 per month, respectfully. Standing job orders are currently at 184 per month (see Figure 3.4)(Lawrence).

The PWD currently employs 267 civilians and is authorized a total of 291 positions. The FY 96 budget was $33 million, including reimbursables. Of this amount, $2.3 million was expended on CRs and WRs. For CRs, $1.3 million and $0.5 million were spent on labor and materials, respectively. WRs processed in-house cost $0.3 million in labor and $0.2 million in materials (Schmidt).

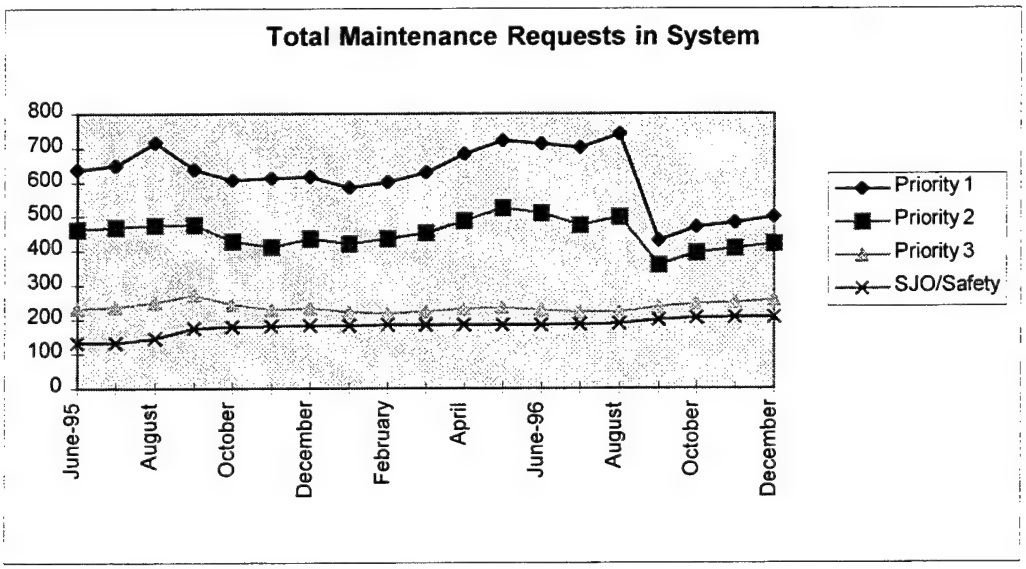

Figure 3.4 Includes all CR and WR requests.

The remaining budget was expended for work requests that were contracted out, mainly administrative costs and reimbursables. Reimbursables are those amounts that are "paid

back" to NPS PWD by specific customers under agreements made between PWD and those organizations that do not have an organic PWD capability.

B. PROCEDURE

The PWD maintenance requests are generated by various departments at NPS, POM and DLI, FHSC and POMA. For simplicity, this report will follow the maintenance request processing at NPS. A similar process is followed at each site.

Maintenance requests are generated by individuals and forwarded to the responsible curriculum officer, department chairperson, or designated building coordinator. The academic department maintenance requests are forwarded to a coordinator, who sets the priority and approves the request before forwarding it to the Maintenance Control Division (MCD). Maintenance requests from other activities and tenant commands are forwarded directly from their respective building coordinators or Officers in Charge (OIC) to the MCD. Because of the varied response time of the individual coordinators, the time between the request generation and receipt by the MCD can be as short as one day or as long as six weeks. The average transit time for a request to reach the PWD is one to three weeks (Schmidt).

The MCD reviews all maintenance requests and screens for proper authorization, validity and correctness. Then, the MCD reviews the maintenance request for priority, PWD capability and the level of maintenance required. In the absence of a priority from the customer, the MCD will assign a priority based on complexity and maintenance time required. Those jobs requiring less time are assigned a higher priority. The MCD then

determines whether the jobs are categorized as CRs or WRs. At this point in the process, CRs and WRs are split into separate tracks. Additionally, WRs are split into jobs within PWD's capability and those that require contractor involvement.

The WRs are logged into the Work Control Management System (WCMS) database by the MCD. The larger WRs are further classified as in-house maintenance or contractor maintenance. In-house WRs are forwarded to the Planner/Estimator (P/E), who prepares a work package that includes the materials, labor, costs and specifications. Once the package is completed, it is returned to the MCD who then forwards it to the Master Scheduler (MS).

The Master Scheduler receives the work package from MCD and logs the request in the WCMS database. The request is then sent to the Shops Division Director for approval and returned to the MS. The package is next routed to the General Foreman (GF) for any questions or comments and back to the MS. Then the package is sent to the production controllers to verify material availability. The MS assigns the job to the appropriate foreman when labor and materials become available. The top twenty list items have priority in this step, but scheduling depends on the proper labor mix and materials simultaneously becoming available.

When assigned to a job, the foreman tracks the WR performance and reports the status of the job to the MS. Once the job is completed, the MS closes out the job in the WCMS and files a copy of the report.

If the material is not in stock, the production division orders the material and the MS enters the job on the awaiting materials list. The production controllers (PC) will manually enter into SACONS the same material request information that has already been

entered into the WCMS database by the MCD. SACONS is the database that only supply and comptrollers use in the material requisitioning process. The redundant data entry into the database occupies roughly half of the PC's time. The purchase request is submitted to the comptroller and the budget department for approval prior to ordering. An emergency request can be completed in hours. A typical request can be filled in one day if the comptroller and the budget department give prompt approval. However, the standard order takes two weeks to fill after approval. Delays often result because similar items are batched for bulk discounts. When the production controllers procure the materials, they inform the appropriate shop supervisors of the materials' arrival (Genegabus).

WRs that are beyond the capabilities of PWD and require contractor involvement, are entered into the WCMS database by MCD. WRs are then passed by the MCD to Engineering to develop both specifications and government cost estimates, and to obtain the necessary funding from the comptroller's office. When engineering is complete, the WR is submitted to the contracting office where government contracting procedures are followed. Once the job is contracted out, the PWD will follow the WR progress, but contract administrators are primarily responsible for properly executing the contract.

The MCD routes maintenance requests determined to be CRs to the dispatcher for action using guard mail. A messenger from the maintenance shop, if available, picks up the CRs twice a day (Williams). Once the dispatcher receives the CR, the data from the work request form is entered into a computerized database known as Emergency/Service Management System (ESMS) and assigned to the appropriate shop foreman. The foreman then assigns the job to a technician. If the job requires material, the technician orders it from the production control division. If the materials are available, the technician

completes the job and the paperwork, giving one copy to the customer and returning one copy to the foreman. The foreman tracks the CR performance and reports the status of the job to the dispatcher. Once the job is completed, the dispatcher closes out the job in the ESMS and files a copy of the report. For those jobs that require ordering materials, the WR process for ordering material, as described above, is followed (Parker).

C. ALTERNATE PROCEDURES

Another avenue for submitting maintenance requests is through the trouble desk, where emergency and non-emergency maintenance requests are performed. The trouble desk is manned by the same individual described as the dispatcher in the CR process. Most requests are taken over the phone by the dispatcher and entered directly into the ESMS. No elaborate processing procedure is required for CRs.

A maintenance request can also be sent directly to the MCD if the customer knows the process. This will avoid all the administrative delays associated with the consolidation process in the building coordinator's office. This procedure is seldom used because the designated coordinator has a signature block on the request form.

A back channel is also created by the "squeaky wheel" concept. This applies to those projects that are already in the system in either AWL or AWM status. Those projects that have a particularly vocal proponent tend to get a disproportionate response. If calls are placed to either PWO, APWO or other high ranking individuals, the work can be placed on the unofficial top twenty list and bypass the established process. This list is

the real priority list that gets resources committed to the project. Projects placed on this list are ranked primarily through political actions (Schmidt).

D. PLANNING

The monthly Public Works Planning Board (PWPB) meeting discusses major issues and sets and/or adjusts priorities. The major output of this body is the top twenty list. This is the official priority list for all major PWD projects. Each department and tenant command has representatives who are required to actively participate and express their departmental concerns during these meetings. However, few representatives are actively involved. This is apparently due to a perceived lack of effectiveness of the PWPB. Those who are involved in the process reap the benefits by having their maintenance requests elevated to a higher priority.

IV. DATA ANALYSIS

The PWD process described in Chapter III does not contain an associated system of data collection that supports management decisions. Processing times are only measured for some of the queues in the system. Otherwise, data collection has been sporadic and incomplete over the years. Management seldom required data analysis for decision making. Therefore, diligent collection of data has not occurred.

A. OVERVIEW

Limited data and separate database systems have limited the analysis of the PWD maintenance request process. The discussion presented in this chapter analyzes the data from the WCMS and the ESMS databases. The SACONS database does not offer meaningful information. Individual requisitions cannot be matched with specific WRs and CRs due to different numbering systems and order batching for material. Therefore, the SACONS data is excluded from the analysis. The goal of this chapter is to identify the areas of technical inefficiencies and bottlenecks in the PWD process. The analysis includes data from FY94 through FY97. Incomplete data from FY97 prevents a complete analysis for this period; however, it will be useful for establishing trends.

B. DATABASES

The PWD collects data in two database systems, SACONS and WCMS. SACONS is used by the production controllers to requisition, track and obtain approvals for required materials from the budget office and the comptroller. The WCMS database is used by the maintenance division to track the progress of CRs and WRs. WCMS is divided into the WCMS database, which tracks the WRs and the ESMS database, which tracks the CRs.

Currently, no direct interface exists between the three databases. This situation creates an information shortage to the decision makers. No one in the maintenance division has access to SACONS, including the MCD, master scheduler and the shop foremen. Therefore, neither maintenance technicians nor supervisors can check the status of the material ordered through SACONS in the WCMS system. Because the SACONS database is only available to the production controllers, the master scheduler and the shop foremen check the status of material requisition by physically asking the PCs. This extra effort is only expended to expedite orders for the most urgent jobs. The norm is to wait for notification from the PCs that the material has been received.

To make some SACONS data available to the maintenance division, limited information is manually transferred to the WCMS database. Currently, only the material ordered date and the received date get transferred to WCMS. The ESMS database contains even less material requisition information. It contains the chit received date and the chit completion date, and no material requisition information.

C. WCMS DATABASE

The WCMS database tracks WRs from the maintenance request received date (R_DAT) to the shop completion date (see Appendix C,D,E,and F). The R_DAT is entered by the MCD, which signals the maintenance request's entrance into the PWD process. It does not reflect the date a customer initially generated the request. The time between the customer's request and receipt by the MCD is not tracked in WCMS.

The PWD process begins with the cumulative time it takes for the MCD to assign the WR to a P/E. The WCMS database represents the P/E assignment time in days in the PE_A field. The majority of WRs have zeroes in this column. However, a few have delays. The delays occur when the job descriptions are unclear or complex. The MCD clarifies vague descriptions and complex jobs before passing the WRs to P/E for evaluation. Delays also occur when the MCD must decide whether the maintenance request is a CR, WR, or contract work. For complex jobs, the MCD decides which jobs are WRs or contract work. This requires assessing the skills of the PWD employees and their ability to acquire the materials and complete the job. The assessment time accounts for the majority of delays in this column.

The PE_C column records the days it takes for a P/E to complete the WR job package. A wide range of job complexity directly influences the high variations in completion times for this step.

The SHOP_A field shows the time it takes for the master scheduler to assign a WR to a shop. The shop assignment depends on labor availability. For WRs requiring only one trade, a specific shop with that trade skill is assigned. However, jobs requiring more

than one trade require more time to assign; the master scheduler assigns WRs when all the labor is available from the different trades. Additional delays occur while the shops Division Director and the General Foremen review the WRs. This delay is added to the SHOP_A column.

The MAT_O column calculates the days it takes for the PCs to order the material. Delay results if too much time is spent searching for the lowest price vendor, or when several small orders are held and consolidated to take advantage of quantity discounts. A further delay occurs if the budget office and the comptroller fail to approve the purchase promptly. Finally, additional time accumulates because the PCs have to manually enter the material requisition data into SACONS when the same data has already been entered in WCMS by the MCD. No interface exists between the databases. So, PCs must duplicate the data entry.

The time accumulated in the MAT_R field represents the vendor response time. The PWD uses two modes of government purchase, credit card and open purchase. Government procurement regulation requires material ordered through credit cards to be received in 30 days. However, a similar regulation does not exist for open purchases. Therefore, excessive delays in vendor response are related to the purchase method. On some emergency orders, the PCs walk through a material requisition and receive it in one day. Non-emergency requisitions, however, remain in the system without ever being expedited. Job urgency is verbally related to the PCs by the job supervisors.

The time it takes for the shops to complete a WR is recorded in the SHOP_C column. After the MCD assigns the job to a specific shop, delays occur as jobs wait for shop labor. The shop foremen balance the labor requirements between CRs, WRs and

reimbursable accounts. Delays occur when the balance is offset by a shift in priority, labor shortages caused by unanticipated circumstances, or funding shortfalls. Additional delays can occur when the scope of the job expands and unexpected work is required.

The final column totals the time in days it takes to complete a WR. The total time is calculated from the date the WR is closed out in the WCMS database, not when the job is actually completed. Delays in closing out the WR add to the total cumulative time.

Table 4.1 presents the mean, percentage of the total mean time, standard deviation and the variance for each category of completed WRs for each fiscal year. It excludes CRs and open WRs. The table also includes the total WRs processed, total WRs completed, and the percentage completed for the fiscal year. The annual completion rate of WRs remained steady at approximately 12 percent of the total WRs in the system each year, with the exception of FY97. A severe budget cut and incomplete data skew the FY97 results. Although only 12 percent of the WRs generated each year are used to calculate the results in Table 4.1, that 12 percent should reflect the variability of the WRs that the PWD receives each year. PWD does not have a systematic job selection process that would bias the results, such as giving priority to jobs that take the least time, material or labor. When materials and labor are available, the master scheduler and shop foremen assign the job regardless of the complexity and the length of time required.

Figure 4.1 graphically presents the mean time to complete each phase of the PWD process. From FY94 to FY97, the mean time to receive the material (MAT_R) and the mean time for shops to complete the job (SHOP_C) account for over 60 percent of the total mean time. Moreover, the shop completion time rises steadily from 27 percent of the total mean time in FY94 to 52 percent in FY97. Conversely, the material receipt time

steadily decreases from 35 percent of the total mean time in FY94 to 21 percent in FY97. However, the percentage decrease is attributable to the spike in the total mean time. In actuality, nominal material receipt time increases during the same period. The large variance in mean time to complete each category reflects the wide variety of WRs that PWD processes. For example, WRs are as simple as replacing a door lock and as complicated as renovating an entire building. The completion times are directly related to the complexity of jobs.

The trends in the remaining categories indicate mixed results. The PE_A mean time and the SHOP_A mean time rise, while the PE_C mean time decreases and the MAT_O mean time remains relatively steady. The most significant rise occurs in the SHOP_A mean time. This rise is related to the SHOP_C mean time since both depend on labor availability.

Figure 4.2 graphically presents the total mean time to complete WRs. The total mean time to complete WRs increases by more than 100 percent over the four years. Delays in labor account for most of the increase. A fifteen percent reduction in the PWD labor force over the four years seems to have exacerbated the labor delays. This makes efficiently allocating limited labor even more important.

Figure 4.3 graphically presents the total WRs processed and the total WRs completed for the fiscal year. PWD completed 12, 13, 11 and 2 percent of the WRs processed in FY94 to FY97 (up to April 11, 1997), respectively. A FY97 cut in labor dollars of over 30 percent will make it difficult to continue the current trend in completion rates. The SHOP_C time is expected to continue its increasing trend because of the shortage in labor dollars. Improvements in other stages are unlikely to offset the delays

from the labor shortage. Thus, the total mean time to complete WRs is likely to increase further.

Fiscal Year 1994

	PE_A	PE_C	SHOP_A	MAT_O	MAT_R	SHOP_C	TOTAL
Mean (days)	1	35	14	14	63	49	181
Percentage of Total Mean	0%	19%	8%	8%	35%	27%	
Standard Deviation (days)	6	75	26	33	60	47	148
Variance (days)	38	5578	686	1105	3576	2237	21880
Total WRs Processed							1273
Total WRs Completed							150
Percentage Completed							12%

Fiscal Year 1995

	PE_A	PE_C	SHOP_A	MAT_O	MAT_R	SHOP_C	TOTAL
Mean (days)	3	24	15	16	62	66	184
Percentage of Total Mean	2%	13%	8%	8%	34%	36%	
Standard Deviation (days)	24	50	18	16	52	61	106
Variance (days)	556	2515	306	268	2721	3685	11242
Total WRs Processed							1525
Total WRs Completed							191
Percentage Completed							13%

Fiscal Year 1996

	PE_A	PE_C	SHOP_A	MAT_O	MAT_R	SHOP_C	TOTAL
Mean (days)	4	35	32	23	61	115	271
Percentage of Total Mean	2%	13%	12%	8%	23%	42%	
Standard Deviation (days)	33	59	48	47	67	109	162
Variance (days)	1108	3433	2292	2240	4484	11810	26144
Total WRs Processed							1447
Total WRs Completed							160
Percentage Completed							11%

Fiscal Year 1997

	PE_A	PE_C	SHOP_A	MAT_O	MAT_R	SHOP_C	TOTAL
Mean (days)	21	22	72	14	77	194	372
Percentage of Total Mean	6%	6%	19%	4%	21%	52%	
Standard Deviation (days)	77	28	145	11	61	234	282
Variance (days)	5860	805	21144	130	3690	54811	79774
Total WRs Processed							948
Total WRs Completed							22
Percentage Completed							2%

Table 4.1 Summary of data analysis.

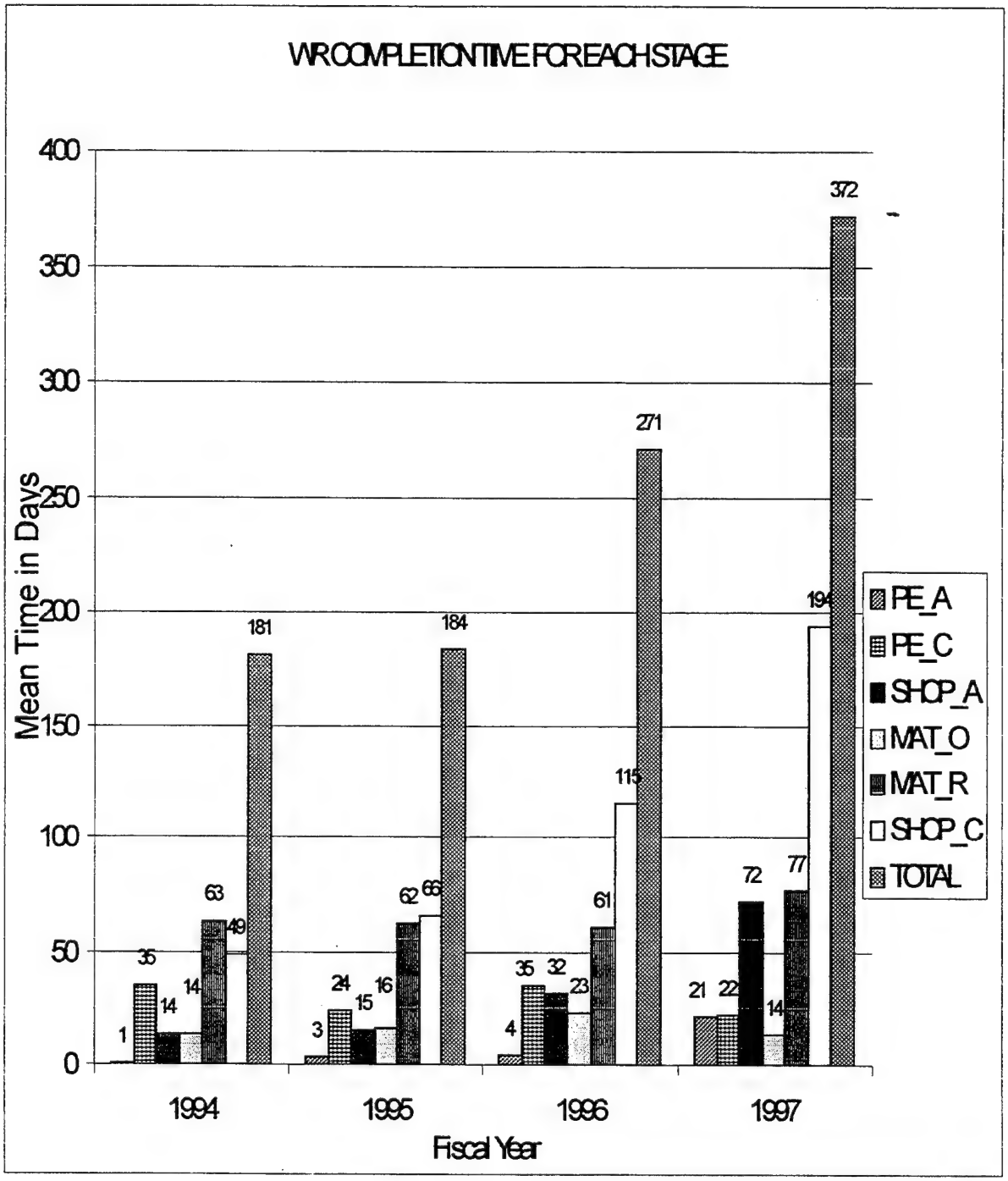

Figure 4.1 Graph of data analysis results.

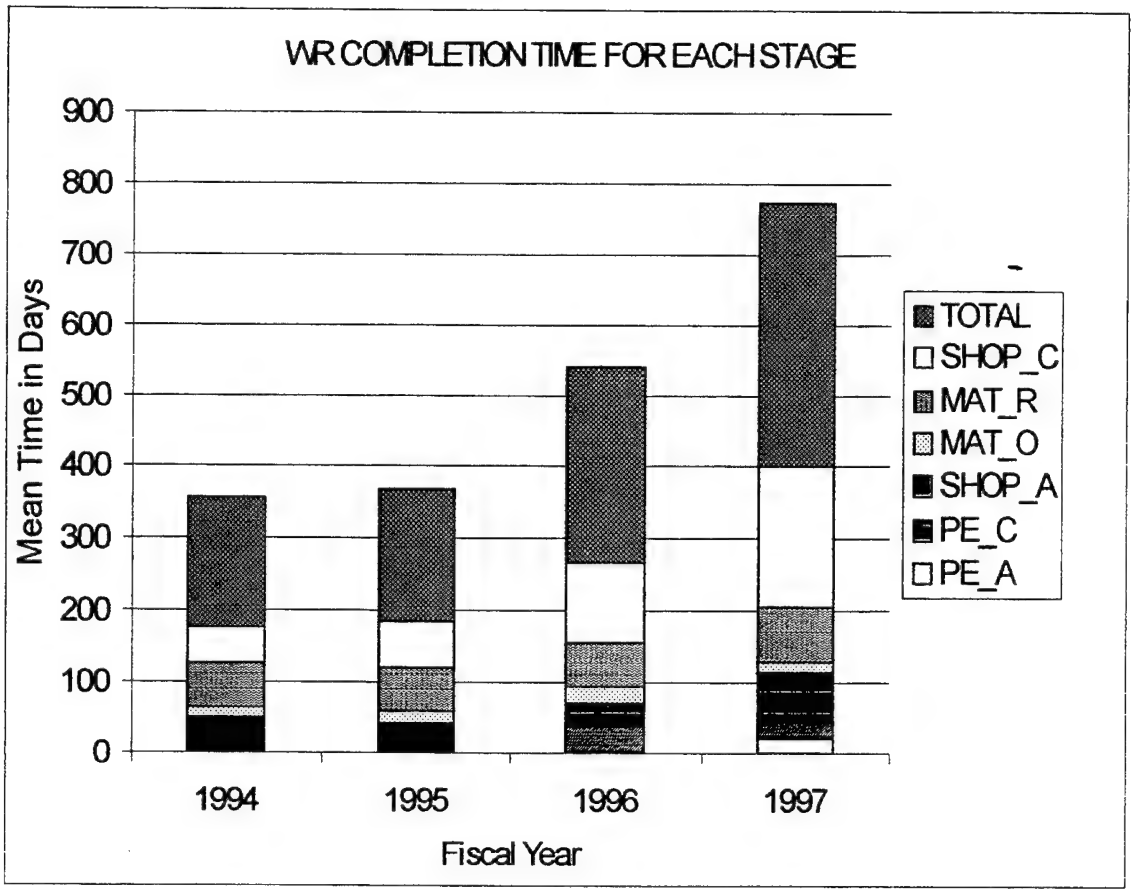

Figure 4.2 Data collected up to April 11, 1997.

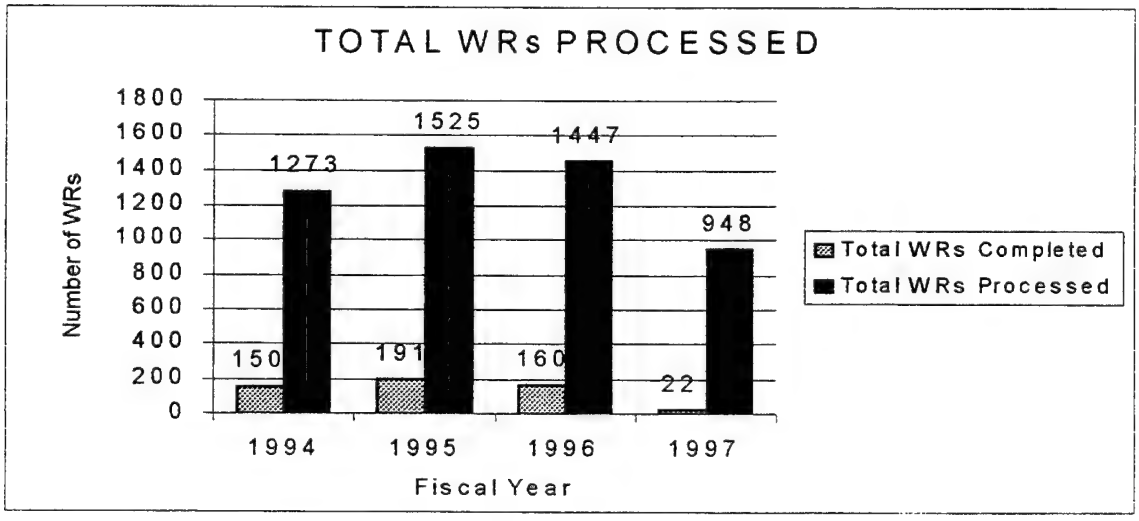

Figure 4.3 Data collected up to April 11, 1997.

D. ESMS DATABASE

Unlike the WCMS database, the ESMS database is not as detailed and does not record the time to complete the various stages in the PWD process (see Appendix G). Instead, only the CR receipt date, completion date and the actual labor time are recorded in the database. This makes it impossible to identify the causes for delays. However, it is suspected that the delays identified for WRs are similar to those for the CRs; primarily the labor and the material requisition phases.

E. CHAPTER SUMMARY

The data analysis suggests several conclusions. First, the largest bottleneck occurs in scheduling labor to jobs. Second, despite the improving trend in percentage terms, the material requisition process remains the second biggest cause of delay. Third, PWD's information technology is not integrated and does not adequately support decision makers. And finally, the limited data collection contributes to inadequate flow of information to decision makers.

V. PROCESS IMPROVEMENT RECOMMENDATIONS

The previous chapter analyzed the limited available data and suggested the need to collect more data. This chapter will make recommendations based on the previous chapter's analysis. These recommendations can be implemented while the PWD collects more detailed data to fine tune its process.

A. INTRODUCTION

The PWD process has many opportunities for improvement, but they will increase their technical efficiency most by concentrating on improvements in three areas: labor scheduling, material requisition and information technology systems. Additional improvements are suggested in allocative efficiency. Although not the primary focus of this thesis, allocative efficiency has an indirect impact on technical efficiency by potentially reallocating resources as adjustments in priorities become necessary.

B. LABOR SCHEDULING

Labor scheduling accounted for 12% and 19% of the total processing time during FY96 and FY97, respectively. Cuts in the labor budget are responsible for some delays, however it appears that optimizing the resources currently available will relieve many of the current problems. An effective prioritization system, coupled with accurate tracking and scheduling, should help the PWD optimize its resource allocation.

In the current atmosphere of budget cuts, resource constraints are amplified by an inefficient scheduling system. The PWD is confronted with limited resources and suggests that funding is their biggest problem. Funding shortcomings seriously debilitate the PWD's operations as evidenced by regular work stoppages when FY funds are exhausted.

The personnel shortage can be attributed to reduced funding due to DOD's reduction-in-force objectives. The personnel shortage is measured by the unfilled authorized billets. However, this may not necessarily measure the real shortage. This shortage may be more accurately described as a shortage of technicians, the "wrench turners" who actually perform repairs. Insufficient technicians delay an already slow and inefficient system, and perpetuate the customers' dissatisfaction with the PWD response time.

One PWD initiative is finding a computerized commercial-off-the-self (COTS) software product to prioritize, track and efficiently schedule larger than CR projects. The master scheduler currently manually schedules all projects. A COTS product could improve this area by maximizing the usage of available labor.

The WCMS contains a scheduling module that is currently not used. The manpower availability plan calculates the actual number of hours available in each shop and the work plan summary estimates the amount of time each shop should spend for each labor class (WCMS User's Manual, p. 7-1). Together, these two modules can create a shop load plan to optimize the available resources. This program is old and cumbersome.

The largest obstacle, besides training in WCMS, is the lack of job standards that are required for its use. A "Chilton's Manual" or some form of standardized job

specifications is required as inputs to this system. This information is used to determine the labor requirements for each job, so that the program can utilize unassigned labor.

Newer products, such as Microsoft Project, are modern and have a Graphical User Interface (GUI). The GUI interface is more intuitive and makes the application more user friendly. However, money for training and software purchase must be obtained by an already tight budget. In any event, the software must be used to obtain any benefits that it can provide.

C. MATERIAL REQUISITION

The material requisition process accounted for 31% and 25% of the total processing time during FY96 and FY97, respectively. Although average material requisition times have improved as a percentage of total time, the total days increased between FY94 and FY97 from 77 to 91 days.

Although government regulations prevent an array of options open to the private sector, further improvements are possible by streamlining and automating the material requisition process. For example, a pre-approved purchase limit could be adopted to avoid delays in the approval process. If needed, the PCs could revert to the line item approvals at the end of each quarter or at a specific budget threshold, such as a percentage of budget authority, to maintain budgetary control.

The possibility of pre-negotiated prices with selected vendors could negate the need for batching orders. These special arrangements could be competitively bided each

FY to ensure competition. This would work especially well with those items that are historically purchased in high volumes.

The automated data entry will free up time for the PCs to become more productive. For instance, they can follow up on vendors to establish reasonable delivery dates. Or, additional time can be used to improve relationships with vendors, with the ultimate goal of improving customer service.

D. INFORMATION TECHNOLOGY

The PWD can improve in all areas by improving its information technology. At a minimum, the PWD needs to accomplish three major objectives with their information technology systems; database consolidation/integration, information dispersion and inter/intranet development.

Integrating the three databases will eliminate many hours of wasted time by reducing the need to manually enter duplicate data into separate systems. For example, integration will allow the P/Es to directly enter information about material requests into SACONS. As a result, the information would be entered into the system only once, reducing the chance of errors and the associated delays with the paperwork shuffle.

Integrating the PWD databases, would create an effective management tool to track the work that is actually completed; the problem of information dissemination would be reduced. This step would allow the MCD and MS to better track projects and respond to changes more efficiently. Upper management would be able to instantly check the

status of a particular project, or the organization's progress as a whole, both of which are now impossible.

The historical accuracy of the current databases is questionable. They contain a limited amount of information, particularly the ECMS. Integrating the systems will force a reconciliation and allow better tracking and accountability for materials and labor. This will enable management to make informed decisions because they will have access to all available information.

Integration will also facilitate implementation of the COTS software that is being considered. This commercial software can improve PWD's priority system, project management and scheduling. This tool will allow management to better control its resources by giving it total asset visibility.

Automating the submission of maintenance requests using electronic mail or the local access network (LAN) will also help reduce process time. Guard mail is now the routine method for transferring maintenance requests to different work centers. A closer examination of the process reveals non-value added steps that would be eliminated via electronic processing; For example, it would automate the flow of WRs between MS-Shop Division Director-MS-GF-MS-PC-MS-Shops.

An added benefit is the improved customer relations that would result from sharing collected information through electronic networks. The PWD is currently a mystery to most of its customers. Because of the perceived lack of urgency, the PWD is viewed as inefficient and unresponsive to its customers' needs. The PWD is trying to improve its customer satisfaction level as well as use its limited resources as efficiently as possible. Information flow to customers, as well as within the PWD, could alleviate some of these

negative perceptions. The capability to implement an electronic request system already exists at the PWD and their customers. The PWD is currently contemplating creating a web page or other electronic format for an improved customer interface (McElderry). Actually integrating of the information systems is beyond the scope of this thesis, but should be considered as an area for further research.

E. ALLOCATIVE EFFICIENCY

Although this report primarily focuses on technical efficiency, the following allocative efficiency issues are noteworthy.

The PWD has limited resources, yet does not prioritize its actions. Instead, priority is determined by customer representatives and then adjusted during the PWPB meetings, but only with customer representative approval. The PWPB is sporadically attended and jobs without active advocates are overlooked in favor of the more vocalized projects. In an effort to gain an equal footing, the PWD has begun to promote its own projects in this forum to compete with other projects. This step was taken to emphasize that the PWD has projects without sponsors that must be completed (McElderry).

The PWPB's primary planning tool is the top twenty list, a group of projects that are currently the organizations' highest priorities. The top twenty list is updated by "pencil" once a month, but no set procedure is followed to systematically track and update the list. The PWPB planning is done manually and no clear picture is developed on how efficiently resources are actually being used. As a result, priorities are constantly changed and precious resources are wasted.

By letting the PWD customers set their own priorities, the PWD loses control over their resources. Because of the perceived time lag between a request and the appropriate action, the majority of the requests are artificially elevated to the highest priority. The customers know that the lower priority requests will not be completed in a reasonable time. Customers are competing against each other for PWD resources. As a result, the internal priorities set by an individual customer are not relevant in PWD's priority system. In some cases, the PWD sets priorities for requests that are not prioritized by the customers.

Funding reductions in PWD's maintenance budget have added to the customers' negative perception of the PWD. Funding cuts have been so severe that the PWD often runs out of money before the fiscal year closes. This freezes all work requests until the next fiscal year, except for the most dire emergencies (Gillis). Moreover, the limited maintenance funds must be divided between two competing types of maintenance, work requests and chit size requests. This competition for funding adds an additional strain on the already scarce resources.

The concept of "funny money or "virtual money" could be implemented to reveal the customer's true priorities. Individual departments would be issued "virtual money" to buy PWD services. The setting of priority would be shifted to the customers who would have a finite set of resources to use. This resource shift would force the customer to carefully weigh each request prior to spending their virtual money, and eliminate the perception that it is costless to artificially elevate a project's priority.

F. METRICS

The PWD does not currently have performance measures that match customer expectations. This is an essential step toward customer satisfaction. The following is a list of possible metrics that could be useful to the PWD:

- Measure project completion time. Use the available data to aggressively cut average completion times.
- Measure the PWD response time to a customer's request. This information will allow the PWD to improve customer relations by demonstrating a sense of urgency.
- Measure the time requests spend in each queue. This will identify problem areas and develop trends that need immediate attention.
- Measure average technician completion times for specific tasks. This will identify training shortfalls.
- Measure specific vendor response times. Use this information to reward faster service during future purchasing decisions and contract negotiations.
- Measure customer satisfaction levels by asking the customers to specifically identify their needs. Use this information to prevent problems before they occur by becoming more responsive.
- Measure customer demands on PWD's services to facilitate the introduction of "virtual money". This will help accurately forecast demand to distribute virtual money.
- Measure the cost of providing services by specific task. This will make comparisons to private sector easier and provide an incentive to become cost conscious.

G. FURTHER RECOMMENDATIONS

The PWD's current physical layout is inefficient. The MCD and MS need to be collocated for closer integration and coordination. Also, the PC and shop supervisors need a closer relationship, since the shop supervisors are responsible for checking the status of material on order.

In an effort to save money and labor, consider batch processing requests. The PWD could implement a standard maintenance schedule for common job requests (i.e., take monthly or quarterly requests for light bulb changes, sidewalk repairs, etc.). This schedule could be changed periodically, as long as customers are notified far enough in advance. This suggestion could easily be implemented through an electronic format.

The PWD should consider redesigning its organizational structure. The current structure may not be appropriate for its assigned mission. This is particularly important if the PWD implements an automated system. The process should be reviewed from a value-added perspective to ensure that an inefficient system is not simply automated. The PWD should not squander the opportunity to change the current system so the organization can better perform its mission.

The PWD should consider outsourcing some of its duties. Outsourcing is defined as traditionally internal work that is completed by hiring private firms. Outsourcing ranges through jobs from mowing lawns to repairing jets (Donnelly). The Army had an active privatization program in the early 1980's, but bowing to resistance ceased the program in 1987 (Cir. A-76). The outsourcing option is now being revisited to generate savings to pay for the force modernization programs scheduled for the next century.

The quickest way to address an inefficient organization is to turn to those businesses that can provide the services you need for the least out of pocket expense. In the short run, this would create immediate savings. In the long run, the organic capability of those skills may be permanently lost. An outsourcing decision also reduces command resource flexibility. Once the resource is gone, the personnel performing those missions are lost. As with any decision, careful consideration must be given to the tradeoffs that will inevitably occur.

The outsourcing option would run into a considerable amount of political resistance by the current PWD employees, as evidenced by the reaction of data center operations, a similar group of government employees. *"Data center directors believe the revised circular (A-76) favors outsourcing over interagency service agreements"* (Donnelly). This perception will prove difficult to combat in a politically charged and emotional environment. A-76 does make outsourcing an easier decision for policy makers. This option is currently under exploration by the PWD (Schmidt).

VI. SUMMARY

A. CONCLUSIONS

Our research suggests the following conclusions:

1. **Technical inefficiency exists in the PWD's resource allocation.**
The PWD suffers from a funding shortage in one area while other areas are fully funded. In particular, funding for labor has been drained while funding for material has not. When funding in one area is depleted, the entire process stalls. The PWD needs to seek a balance in funding for different areas. This will require reprogramming funds, which in turn, requires the PWD to participate more aggressively in the NPS budgeting process and communicate openly with the comptroller's office.

2. **Labor allocation is another area contributing to technical inefficiency.**
There is no systematic approach to scheduling labor. The WCMS has a labor management module that interfaces with its database. However, the system is outdated and never used. More powerful and user-friendly COTS scheduling software is available and would better fit the PWD's needs. Automated scheduling would increase efficiency from the current manual scheduling. Idle times would be minimized and labor utilization rates would increase.

3. **The PWD needs to develop standardized maintenance requirement cards for routine jobs.**
For example, a maintenance requirement card for a task would contain the material required, labor hours required and basic steps to complete the job. Used in conjunction with COTS, maintenance requirement cards would facilitate efficient labor scheduling, data collection and statistical process controls.

4. **Although some useful data is available to management, it is not used for decision making.**
This is primarily due to the difficulty in obtaining the required information in an understandable format. Information contained in collected data can reveal inefficiencies and problem areas. They can aid management in deciding a course of action to correct bottlenecks and streamline the PWD process. The PWD possesses the necessary technology to collect and distribute the data. Management should decide which data to collect and hold everyone accountable for the accuracy of the database.

5. **The overall system for processing maintenance requests contains non-value-added steps that can be eliminated.**
First, the WR review process needs to be consolidated to a single point. Before the WRs reach the MCD for final review, no less than three managers have reviewed the request for the same criteria. Second, the job package review and job assignment process should also be consolidated to a single point. The current system requires that job packages be reviewed by four managers before assignment to shops. The consolidation would eliminate the need for tracking the job packages, reduce the time to assign the job to the shops and eliminate potential delays due to inaction.

6. **Automating the maintenance request process would reduce delays and redundancies.**
Using an electronic format for submitting, reviewing and approving WRs and job packages would allow the process to be completed simultaneously without the need for the cumbersome paper shuffle.

7. **The material requisition process takes too long.**
Some actions are repetitive and can be eliminated. Other time consuming actions are required by regulations and are beyond PWD's control. The PWD should focus on improving areas of the process within its control. By eliminating repetitive actions and streamlining the requisition process, PCs would have more time to follow up on outstanding requisitions and expedite shipments from vendors.

B. AREAS FOR FURTHER RESEARCH

- Conduct an in-depth analysis of allocative efficiency and the concept of "virtual money" to reveal customers' true priorities.
- Analyze PWD's organizational structure to determine its structural fit with its operational mission.
- Conduct location analysis to determine the feasibility of consolidating the PWD into a single building. Current fragmentation of the PWD divisions contributes to process delays and makes internal communications difficult.
- Research the possibility of automating the maintenance request submissions through the internet and LAN.
- Conduct a manpower study to determine the proper mix of administrative staff and technicians.

- Analyze the costs and benefits of outsourcing the PWD functions.
- Analyze the costs and benefits of maintaining an inventory system.

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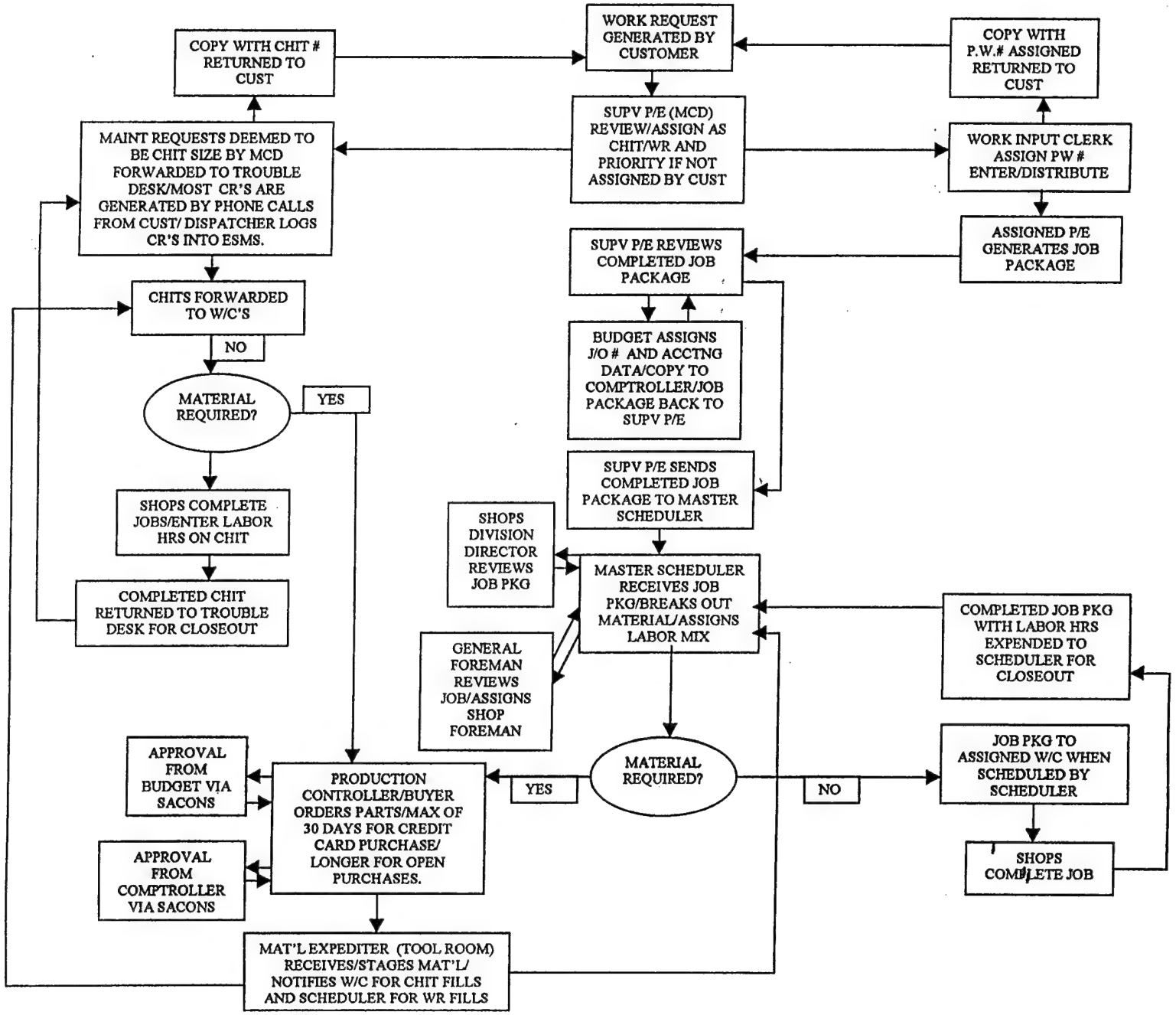
APPENDIX A: MAINTENANCE REQUEST PROCESS FLOW


WORK REQUEST GENERATED BY CUSTOMER
COPY WITH CHIT # RETURNED TO CUST
COPY WITH P.W.# ASSIGNED RETURNED TO CUST
SUPV P/E (MCD) REVIEW/ASSIGN AS CHIT/WR AND PRIORITY IF NOT ASSIGNED BY CUST
MAINT REQUESTS DEEMED TO BE CHIT SIZE BY MCD FORWARDED TO TROUBLE DESK/MOST CR'S ARE GENERATED BY PHONE CALLS FROM CUST/ DISPATCHER LOGS CR'S INTO ESMS.
WORK INPUT CLERK ASSIGN PW # ENTER/DISTRIBUTE
ASSIGNED P/E GENERATES JOB PACKAGE
SUPV P/E REVIEWS COMPLETED JOB PACKAGE
CHITS FORWARDED TO W/C'S
BUDGET ASSIGNS J/O # AND ACCTNG DATA/COPY TO COMPTROLLER/JOB PACKAGE BACK TO SUPV P/E
NO
MATERIAL REQUIRED?
YES
SUPV P/E SENDS COMPLETED JOB PACKAGE TO MASTER SCHEDULER
SHOPS COMPLETE JOBS/ENTER LABOR HRS ON CHIT
SHOPS DIVISION DIRECTOR REVIEWS JOB PKG
MASTER SCHEDULER RECEIVES JOB PKG/BREAKS OUT MATERIAL/ASSIGNS LABOR MIX
COMPLETED CHIT RETURNED TO TROUBLE DESK FOR CLOSEOUT
COMPLETED JOB PKG WITH LABOR HRS EXPENDED TO SCHEDULER FOR CLOSEOUT
GENERAL FOREMAN REVIEWS JOB/ASSIGNS SHOP FOREMAN
APPROVAL FROM BUDGET VIA SACONS
PRODUCTION CONTROLLER/BUYER ORDERS PARTS/MAX OF 30 DAYS FOR CREDIT CARD PURCHASE/ LONGER FOR OPEN PURCHASES.
YES
MATERIAL REQUIRED?
NO
JOB PKG TO ASSIGNED W/C WHEN SCHEDULED BY SCHEDULER
APPROVAL FROM COMPTROLLER VIA SACONS
SHOPS COMPLETE JOB
MAT'L EXPEDITER (TOOL ROOM) RECEIVES/STAGES MAT'L/ NOTIFIES W/C FOR CHIT FILLS AND SCHEDULER FOR WR FILLS

APPENDIX B: MAINTENANCE REQUEST FORM

WORK REQUEST (MAINTENANCE MANAGEMENT)

NAVFAC 9-11014/20 REV. 2-68) S/N 0105-LF-002-7510
Supersedes NAVDOCKS 2351

(PW Department see Instructions in NAVFAC MO-321)

Requestor see Instructions on Reverse Side

PART I—REQUEST (Filled out by Requestor)

1. FROM	2. REQUEST NO.
3. TO	4. DATE OF REQUEST
5. REQUEST FOR ☐ COST ESTIMATE ☐ PERFORMANCE OF WORK	5a. REQUEST WORK START
6. FOR FURTHER INFORMATION CALL	7. SKETCH/PLAN ATTACHED ☐ YES ☐ NO

8. DESCRIPTION OF WORK AND JUSTIFICATION *(Including location, type, size, quantity, etc.)*

9. FUNDS CHARGEABLE	10. SIGNATURE *(Requesting Official)*

PART II—COST ESTIMATE
(Filled out by Maintenance Control Division if estimate requested)

11. TO:	12. ESTIMATE NO.

13. COST ESTIMATE	
a. Labor	$
b. Material	$
c. Overhead and/or Surcharge	$
d. Equipment Rental/Usage	$
e. Contingency	$
f. TOTAL	$

14. SKETCH/PLAN ATTACHED ☐ YES ☐ NO

15.

☐ APPROVED. PROGRAMMING TO START IN _____

☐ APPROVED. BASED ON PRESENT WORKLOAD, THIS JOB CAN BE PROGRAMMED TO START IN _____ IF AUTHORIZED BY 25TH OF _____ AND FUNDS ARE MADE AVAILABLE.

☐ DISAPPROVED. *(See Reverse Side)*

16. SIGNATURE	17. DATE

PART III—ACTION (Filled out by Requestor)

18. TO:

19. AUTHORIZATION TO PROCEED IS ATTACHED *(Check one if other than PW funds are involved)* ☐ NAVCOMPT 140 ☐ OTHER	20. WORK REQUESTED ☐ HAS BEEN CANCELLED ☐ HAS BEEN DEFERRED ☐ WILL BE PERFORMED BY OTHERS
21. SIGNATURE	22. DATE

(See Part IV on Reverse Side)

APPENDIX C: WCMS DATA FOR COMPLETED FY94 WRs

PW_NUM	JOB_DESC	JON1	PE_A	PE_C	SHOP_A	MAT_O	MAT_R	SHOP_C	TOTAL	R_DAT
220-1091	RM 129(CPO)-REPAIR/REPLACE 2"DRAIN IN OV	422445	0	13	0	14	55		1089	6/28/91
43H-2042	REPLACE WATER PUMPS, ELECTRICAL, DEMO "B	4RM613	0	531	0	31	125	83	770	4/21/92
FNOC3001	BLDG 700 - INSTALL A DRAIN LINE FROM AIR	4RR533	0	596	7	6	42	54	705	10/6/92
MISC2028	ACADEMIC & ADMIN BLDGS - INSTALL LOW FLO	422320	0	1	0	13	517	89	620	5/19/92
232-2028	REPAIR LEAKING ELBOW IN RM 133. *** ASBE	422407	0	163	12	28	71	324	598	4/7/92
220-3008	BLDG 220 - INCREASE & BALANCE AIR FLOW T	422461	0	7	1	385	86	1	480	10/13/92
FNOC3009	BLDG 700 - PROVIDE AND INSTALL ISLE LIGH	4RR510	0	98	143	88	121	27	477	12/21/92
427-3000	BLDG 427 - ENCLOSE LUNCH BREAK AREA	422526	0	22	198	28	61	163	472	12/14/92
232-3067	BLDG 232 - REPAIR/REPLACE STORMWATER SUM	422734	0	193	7	4	91	105	400	4/26/93
232-3024	BLDG 232 - REPAIR FLOOR TILES ON 4TH AND	422587	0	116	0	1	49	224	390	12/11/92
220-3056	BLDG 220 - RE-FINISH INTERIOR OF MAIN EL	422644	0	135	13	21	84	129	382	2/8/93
43H-3059	LEVEL GRASS AT QTRS J, RAISE, & REPLACE	4RM646	0	67	20	1	234	36	358	6/7/93
232-3060	BLDG 232 - MODIFY ROOM 409	422753	0	125	121	5	63	43	357	4/8/93
216-3000	BLDG 216 - REPAIR ELEC. HEATER IN ROOM 1	422543	0	71	1	12	217	38	339	11/24/92
235-3048	BLDG 235 - INSTALL A DOOR BETWEEN ROOMS	422761	0	16	110	16	174	16	332	8/16/93
232-3061	BLDG 232 & BLDG 221 - REKEY ALL COMPUTER	422776	0	238	27	7	54	0	326	4/8/93
220-3099	BLDG 220-REPLACE CEILING TILES IN SCULLE	422624	0	1	8	1	116	192	318	5/17/93
427-3007	BLDG 427 - MOVE P.W. LOCKSHOP TO BLDG 42	422760	0	171	10	8	62	53	304	6/22/93

FNOC3044	BLDG'S 700/708 - PROVIDE ELECTRICAL FOR	4RR507	0	48	51	19	173	11	302	8/5/93
234-3022	BLDG 234 - REHABILATE & QUIET LINAC COOL	422720	0	44	0	6	140	110	300	8/25/93
220-3123	B220A/RM 145A - INST SLIDING WINDOW & V-	422798	0	187	7	3	67	35	299	7/28/93
REC-3020	BLDG 58 - INSTALL A 1 HOUR FIRE WALL IN	422785	0	131	10	13	88	50	292	9/2/93
303-4003	BLDG 303 ELEV - REINFORCE EXIST & INSTAL	422769	0	7	9	14	44	215	289	12/6/93
439-3010	INSTALL 4 OUTSIDE DRINKING FOUNTAINS AT	422733	0	0	53	28	56	146	283	9/20/93
514-3004	REPLACE RUSTED, OBSOLETE PANELBOARD. (NE	422751	0	70	106	6	63	29	274	6/16/93
235-3049	BLDG 235 - MODIFY ROOMS 232/234 FOR MR D	422698	0	43	19	71	84	50	267	8/17/93
330-3018	ROOMS ON THE SECOND AND THIRD FLOORS, IN	422631	0	0	4	27	181	54	266	6/7/93
MISC3097	PROVIDE/INSTALL "ONE WAY" AND "DO NOT EN	422725	0	119	4	32	36	71	262	6/28/93
232-3087	B232/RM 500 - RELOCATE 18KVA UPS/PWR CON	422714	69	1	11	4	101	59	245	7/29/93
259-3004	BLDG 259-PURCHASE NEW & REPLACE HEAT EXC	422652	0	1	41	6	150	44	242	6/1/93
222-3004	BLDG 222 - REPLACE BATHROOM LIGHT FIXTUR	422551	0	4	4	9	207	17	241	2/8/93
GRND3003	CONSTRUCT NON-POTABLE IRRIGATION SYSTEM	422563	0	2	18	2	141	77	240	2/9/93
214-3000	BLDG 214 - PROVIDE/INSTALL 3 FLUORESCENT	422578	0	27	7	10	153	43	240	2/24/93
237-3009	BLDG 237 - REPLACE SEWAGE LIFT PUMPS	422707	0	9	24	11	154	41	239	9/15/93
339-4003	BLDG 339 - REPLACE THREE 5 HP/440V/3Hz E	422747	0	22	6	4	152	50	234	11/8/93
FNOC3030	BLDG'S 700,701 703, & 28 INSTALL 2" & 1"	4RR519	0	81	80	0	56	10	227	5/17/93
200-4001	BLDG 200 - MODIFY WORK SPACE ON	422794	0	38	17	3	132	32	222	12/14/93

	1ST FLOO									
236-3007	BLDG 236 - REPLACE LEAKING SWIMMING POOL	422663	0	14	3	12	51	139	219	7/12/93
PLOT3001	PROVIDE "DISABLED" PARKING SPACES-MAIN S	422669	0	35	8	21	109	46	219	6/24/93
339-4001	BLDG 339 - PROVIDE SECURITY TO DOORS	422750	0	22	30	8	19	138	217	10/18/93
228-4000	BLDG 228 - INSTALL 2.5 GPM SHOWER HEADS	422716	0	0	10	7	28	169	214	10/8/93
232-4020	BLDG 232 - INVESTIGATE & SOLVE NO HEAT I	422806	0	5	3	5	104	96	213	2/10/94
203-4012	BLDG 203 - RENOVATE ROOMS 309 AND 310	4RR528	0	20	27	6	71	85	209	2/24/94
FNOC4011	BLDG 702 - PROVIDE COOL AIR TO CLOSET SP	4RR509	0	8	10	19	107	60	204	11/8/93
REC-4004	BLDG 191 - REPLACE 19 LIGHT FIXTURES IN	4RR523	0	22	5	12	84	79	202	12/16/93
FNOC4005	BLDG 700 - OVERHAUL AIR HANDLER S-5/S-6	4RR506	0	11	2	2	129	57	201	10/21/93
220-4014	BLDG 220 RM 028 - IMPROVE/INCREASE VENTI	422735	0	33	6	16	99	43	197	10/7/93
235-4017	BLDG 235 - PROVIDE MORE ELEC POWER TO RO	422805	0	36	3	12	41	103	195	1/10/94
216-4000	BLDG 216 - REPLACE/UPGRADE 3 HP AIR COMP	422727	0	26	9	10	93	57	195	10/1/93
43H-4119	14 REVERE: MAKE CONCRETE PATIO SLAB DRAI	4RM664	0	1	4	2	83	94	184	3/23/94
220-4067	BLDG 220 - INSTALL TRACK LIGHTING FOR SU	422820	0	31	4	10	31	102	178	2/1/94
220-3126	BLDG 220 - REPAIR WALLS/PAINT IN 3RD DEC	422705	0	54	20	44	35	24	177	8/5/93
339-4007	BLDG 339, ELEVATORS #1 & 2-INST SHUTOFF	422757	0	2	12	9	63	90	176	12/6/93
302-3039	BLDG 302 - INSTALL ELEC OUTLET IN RMS 38	422653	0	57	5	7	85	22	176	5/18/93
302-4018	BLDG 302 - PROVIDE/INSTALL NEW	422842	0	4	2	20	147	3	176	3/31/94

	MOTOR FOR									
220-4024	BLDG 220 RM 313 - ASSEMBLE/INSTALL ICE M	422746	0	28	5	2	38	102	175	10/29/93
234-3016	B234/RM 031 - INSTALL SIX(6) DOUBLE DUPL	422681	0	75	3	7	55	33	173	6/3/93
FNOC4031	BLDG 704 - INSTALL CONDUIT IN 224/214/22	4RR532	0	78	21	14	34	25	172	2/15/94
43H-4043	SOQ F: REPLACE FALLEN STREET LIGHT & MAK	422773	0	6	6	9	72	76	169	12/16/93
MISC3107	PUR/INST LO-FLO TOILETS & URINALS IN BLD	422671	0	9	3	62	51	44	169	7/28/93
43H-4022	ON STATION QTRS-INSPECT/TEST ALL OUTLETS	4RM651	0	6	1	14	37	110	168	11/24/93
MISC3087	INSTALL SLATS IN FENCE BEHIND NAVY EXCHA	422640	0	34	1	56	30	46	167	5/25/93
220-4004	BLDG 220 - INSTALL ELECT. EXIT SIGNS IN	422717	0	8	10			108	164	10/4/93
234-4002	BLDG 234 - INSTALL SOUND SUPRESSION EQUI	422793	0	10	18	3	83	48	162	1/10/94
237-4002	BLDG 237 - ELECTRIFY STUDY CARRELLS	422759	0	35	12	17	68	30	162	11/3/93
203-3005	BLDG 203 - TEAR DOWN WALLS IN ROOMS 311	422697	31	13	32	3	48	31	158	8/3/93
220-4109	BLDG 220 - CLEAN AND OIL PANNELING ON Q-	422841	0	6	10	18	57	66	157	3/22/94
220-3154	B220-REPLACE DETERIORATED/DAMAGED GUTTER	422713	0	7	12	11	108	14	152	9/29/93
220-4040	BLDG 220 - CONSTRUCT SHELVING UNIT	422754	0	16	2	7	38	88	151	11/22/93
MISC4067	REPLACE SEWAGE LIFT PUMPS	422853	0	3	11	2	114	21	151	4/25/94
238-3001	B201-STEAM PIT - REMOVE ASBESTOS/REPAIR	422703	0	1	19	11	18	101	150	9/28/93
203-4004	BLDG 203 - INSTALL A PR VALVE ON BLDG 20	422784	0	0	15	12	68	53	148	1/6/94
302-4003	BLDG 302 - ADD ELECT. POWER IN ROOM 378	422781	0	69	8	10	37	23	147	10/29/93
239-3007	BLDG 239 - INSTALL 9 ELEC OUTLETS IN	422723	0	28	11	14	51	42	146	9/23/93

	SQU										
235-3058	BLDG 235/RM 200A - INSTALL 6 ELEC OUTLET	422737	0	42	14	13	49	28	146	9/23/93
220-3140	BLDG 220 SUB-BASEMENT - RELOCATE GREASE	422710	0	25	14	7	28	68	142	9/9/93
FNOC3043	BLDG 28 - PROVIDE SECURITY MEASURES TO W	4RR500	0	31	65	2	14	26	138	7/21/93
300-4004	BLDG 300 - REPAIR LEAKING ROOF	422770	2	8	6	7	57	57	137	12/6/93
235-4019	BLDG 235 - INSTALL AC BOXES FOR PHONE LI	422811	0	31	10	17	40	38	136	1/18/94
215-4000	BLDG 215 - REPLACE 3 PHASE FEEDER CONDUC	422866	0	73	4	8	35	16	136	2/28/94
439-4003	BLDG 439 - INSTALL MINI-BLINDS ON ALL WI	422766	0	0	12	8	90	25	135	12/8/93
349-3001	INST RAILINGS, BUMPERS AND GUTTERS ON LO	422657	0	0	9	6	56	62	133	7/13/93
220-4082	BLDG 220 - REPAIR/REPLACE UPPER GALLEY P	422816	0	8	4	16	63	42	133	2/17/94
209-4003	ADD A STORAGE SHED BY B-209 FOR CHOLORIN	422874	0	24	6	43	15	44	132	5/2/94
235-3038	BLDG 235, ROOMS 103 B,C, & D, INSTALL RE	422661	0	3	5	11	72	41	132	7/14/93
302-4007	BLDG 302 - INST. SHUTOFF VALVE AND RELOC	422762	0	4	10	9	84	22	129	12/6/93
FNOC3035	B700 - EXTENT ROOF VENTS SERVING BOILERS	422645	0	15	8	11	63	31	128	6/16/93
MISC3095	REPAIR FIRE HYDRANT AT NPS GAS STATION	422651	0	26	1	15	61	25	128	6/16/93
439-4000	BLDG 439 - INSTALL WINDOWS IN CLOSET DOO	422752	0	18	3	6	43	49	119	11/18/93
235-4000	BLDG 235 - MODIFY ROOM 107 FOR CODE CC	422724	0	16	11	9	57	23	116	10/5/93
MISC4060	BLDG 200-REPAIR POLICE RADIOS	422834	0	0	2	18	84	12	116	3/30/94
203-4003	BLDG 203 - REMOVE FIRE DOOR/INSTALL SELF	4RR524	0	38	10	2	28	37	115	12/28/93
235-3042	B235/RMS 272 & 277A - RENOVATE	422682	0	35	2	27	14	36	114	7/19/93

	SPACES FO									
330-3023	BLDG 330 - REPLACE ATS MOTOR IN ROOM 136	422648	0	7	0	6	71	30	114	6/30/93
MISC4020	3RD ST GATE: REPAIR GROUND FAULT CIRCUIT	422771	0	8	6	15	41	43	113	12/8/93
221-4022	BLDG 221 - REMOVE ACOUSTIC TILES IN 313	422836	0	1	16	5	57	34	113	3/15/94
258-4000	BLDG 258 - REPAIR THE CONDENSATE LINE N	422731	0	4	3	10	29	64	110	10/29/93
43H-4002	CONSTRUCT FENCE FOR MOQ L	4RM609	0	16	1	27	28	38	110	10/18/93
339-4015	BLDG 339 - RELAMP VARIOUS LOCATIONS IN B	422878	0	0	16	19	50	25	110	5/24/94
235-4002	AIS: B235 - RESEAL ROOF SKYLIGHTS	422715	0	0	6	11	46	46	109	10/12/93
WATR4000	PROVIDE TEMPORARY WATER SERVICE FOR NEW	422768	0	11	5	7	63	23	109	12/6/93
235-3037	BLDG 235 -REPAIR POWER FUSES, & IDENTIFY	422670	0	22	8	13	40	24	107	7/7/93
330-3040	BLDG 330 - REMOVE WALL BETWEEN 361/362	422719	0	25	4	12	34	29	104	9/23/93
220-4131	BLDG 220 - REPLACE LAUNDRY ROOM DOOR IN	422859	0	1	13	2	28	59	103	4/25/94
MISC3109	INSTALL STOP SIGN & PIPE BARRIER POSTS	422696	0	32	9	33	22	7	103	7/30/93
220-3114	BLDG 220 - CONSTRUCT RETAINING WALL IN T	422683	0	48	4	6	43	2	103	7/6/93
MISC4022	HOOK UP ELEC POWER FOR PARTS CLEANERS IN	422786	0	30	9	10	25	28	102	12/13/93
203-3006	BLDG 203 - INSTALL PARTITION WALLS & DOO	422709	0	46	17	2	21	16	102	8/16/93
220-4056	BLDG 220 - CLEAN KOI POND & REPLACE FOUN	422787	0	2	9	13	68	10	102	1/10/94
220-4083	BLDG 220 - CONSTRUCT A COVER FOR 3 CONDE	422819	0	7	3	13	32	46	101	2/22/94
235-3056	BLDG 235/RMS 103I & J - REMODEL CODE 39	422740	0	54	2	1	40	1	98	9/23/93
220-4075	BLDG 220 - RE-KEY NEW HRO OFFICES	422807	0	1	1	13	79	3	97	2/15/94

MISC4037	FABRICATE 65 SIGNS FOR RV PARKING LOT	422812	0	0	24	18	18	35	95	2/4/94
FNOC4047	BLDG 704 - MODIFY CABINET FOR COFFEE MAK	4RR530	0	6	29	15	19	26	95	4/20/94
220-4023	BLDG 220 - RUN EMT CONDUIT FROM PAO OFFI	422743	0	23	6	21	21	24	95	10/26/93
GRND4013	BLDG 220 - CLEAN-UP AND LANDSCAPE AROUND	422854	0	0	14	3	61	17	95	4/25/94
MISC3106	NPS QUADRANGLE AREA - INSTALL FOOTING AN	422676	0	22	6	10	25	31	94	7/20/93
43H-4035	PLACE BRACES UNDER TREE LIMBS BY SOQ'S	4RM654	0	6	6	16	35	27	90	12/8/93
232-3098	BLDG 232 - REPLACE HATCHWAYS TO 7TH DECK	422729	0	34	9	11	2	33	89	9/23/93
302-4017	BLDG 302 - REPLACE FAULTY RESTROOM METER	422823	0	1	10	3	47	28	89	3/3/94
220-4171	BLDG 220 - CONVERT LADIES RESTROOM INTO	4RRY95	0	25	19	1	20	23	88	6/27/94
239-4003	BLDG 239 - INSTALL RUBBER FLOOR TILES IN	422837	0	1	3	5	27	49	85	3/28/94
220-4139	B220-SECURE VALANCES ON BALLROOM WINDOWS	422875	0	14	9	6	23	29	81	5/9/94
ELEC4000	REPLACE JUNCTION BOX COVER AT T-19	422790	0	3	8	6	35	28	80	1/10/94
43H-4113	378D BERGIN: REPLACE CRACKED CONCRETE	4RM662	0	4	3	4	21	43	75	3/17/94
43H-4106	QTRS "M" - INSTALL TRACK LIGHTING	4RM659	0	1	4	8	33	28	74	3/10/94
GRND4015	INSTALL DRIP IRRIGATION STSYEM IN ROSE G	422861	0	0	8	1	4	58	71	5/4/94
MISC4044	CONSTRUCT 25 BURLAP SCREENS	422821	0	4	4	9	19	35	71	2/28/94
221-4028	BLDG 221 - INSTALL CLOSET DOORS IN RM 22	422840	0	15	8	7	18	21	69	3/15/94
FNOC4002	BLDG 28 - PROVIDE/INSTALL TWO DOORS WITH	4RR520	0	4	20	0	16	26	66	10/1/93
43H-4026	65 TOWNHOUSES - INSTALL EXTERIOR MAILBOX	4RM653	0	5	4	7	31	19	66	11/24/93

235-4027	B235-REKEY RESEARCH OFFICE SPACES, RMS 2	422824	0	2	3	4	31	23	63	3/9/94
302-4021	BLDG 302 - REPAIR POTABLE WATER PRV & RE	422869	0	5	2	8	33	15	63	5/12/94
220-4011	BLDG 220 - MOVE FAMILY SERVICES CENTER S	422718	0	9	8	5	5	22	49	10/5/93
220-4094	BLDG 220 - REMOVE ALL WALL LIGHTS IN BOQ	422830	0	10	2	1	33	3	49	3/4/94
FNOC4088	BLDG 700 - MODIFY RM 175	4RR539	0	11	6	2	6	22	47	8/5/94
43H-4210	PERFORM MOVE-OUT MAINTENANCE ON MOQ-M	4RM673	0	1	1	7	23	13	45	7/25/94
302-4010	B302 - INSTALL CONDUIT & PULL BOXES FOR	422791	0	11	1	1	20	12	45	1/14/94
301-4001	B301-CUT 15" HOLE IN CEILING FOR SECURIT	4RR504	0	1	12	0	11	18	42	10/12/93
MISC3121	INSTALL 2 RADIOS	422688	0	1	3	23	6	9	42	8/26/93
210-4006	INSTALL A WATER FOUNTAIN AT SWIMMING POO	422894	0	8	9	6	0	16	39	6/28/94
43H-4062	REMOVE ASBESTOS FLOOR TILES AT 1130 SPRU	4RM610	0	15	2	6	0	15	38	1/18/94
FNOC4077	BLDG 700-REPLACE SHAFT/FAN/BEARING SUPPL	4RR534	0	0	0	3	9	23	35	7/22/94
220-4168	BLDG 220 - LANDSCAPE AROUND HANDICAP RAM	422888	0	1	4	2	15	9	31	6/23/94
FNOC4078	BLDG 700 - REPLACE CIRCULATING PUMP IN C	4RR536	0	1	5	2	14	9	31	7/26/94
235-4014	BLDG 235 - RE-FURBISH ROOM 106B	422772	0	0	7	2	15	0	24	12/20/93
330-4022	BLDG 330 - INSTALL 232 LOCKERS IN 4TH DE	422886	0	2	0	5	0	16	23	6/21/94
FNOC4018	BLDG 700 STEAM BOILERS - REPLACE/INSTALL	422764	0	1	2	5	8	1	17	12/13/93
FNOC4019	BLDG 15 BOILER - REPLACE/INSTALL HEADER	422765	0	1	2	5	8	1	17	12/13/93

AVERAGES	0	35	14	14	63	49	181
STANDARD DEVIATION	6	75	26	33	60	47	148
VARIANCE	38	5578	686	1105	3576	2237	21880

APPENDIX D: WCMS DATA FOR COMPLETED FY95 WRs

PW_NUM	JOB_DESC	JON1	PE_A	PE_C	SHOP_A	MAT_O	MAT_R	SHOP_C	TOTAL	R_DAT
234-4000	BLDG 234-REPLACE TWO 7-1/2 HP COMPRESSOR	522779	0	24	27	9	103	505	668	11/22/93
WATR3005	B214 - REPLACE 200' OF 8" SEWER LINE BET	522994	0	525	13	10	34	49	631	8/3/93
232-3069	BLDG 232 - REPLACE DOOR HINGES IN RM 431	522809	0	285	14	8	105	176	588	4/29/93
220-3113	BLDG 220 - INSTALL WINDOW WIND DEFLECTOR	522847	286	3	7	8	145	61	510	6/29/93
220-4117	BLDG 220 - RESURFACE TOWER AND 4TH DECK	522844	0	0	20	110	2	375	507	4/1/94
439-3011	BLDG 439 - DESIGN/INSTALL SHADES/SCREENS	522802	61	99	2	7	249	39	457	9/7/93
221-4012	B221-REPLACE DOOR LOCKS WITH DEADBOLTS I	522826	0	52	6	11	357	23	449	1/18/94
235-3050	BLDG 235 - MODIFY ROOMS 236 AND 236B FOR	522849	0	238	9	7	41	144	439	8/18/93
221-4056	B221-PROVIDE WINDOW SCREENS FOR 502,503,	5RRE98	0	1	74	91	123	111	400	8/17/94
ANNX4003	PAINT TOP OF WATER TANK #74 AT ANNEX	522931	0	13	49	16	198	111	387	8/30/94
MISC4190	PT SUR/BLDG 114 - PROVIDE/INSTALL ELECTR	5RDHRV	0	101	7	13	230	30	381	7/11/94
MISC4063	PURCH/INST 1.6 gpf TOILETS IN BLDGS:232,	522845	0	11	9	8	227	109	364	4/1/94
FNOC4082	B700/RM 162-PROVIDE/INSTALL EMERGENCY PO	5RR542	45	2	6	63	111	109	336	7/29/94
MISC4179	INSTALL DOORS/WALL TO ENCLOSE CARPET STO	522881	0	0	11	8	62	248	329	6/9/94
MISC4065	CONSTRUCT A PORTABLE STAND FOR A BULLETI	522848	0	2	5	11	123	184	325	4/18/94
DLI-4001	BLDG 366 POM: INSTALL DEDECATED CABLE AN	5R95QA	0	34	10	12	92	168	316	8/30/94
235-4061	BLDG 235 - INSTALL WALL IN RM 272	522943	0	61	9	25	153	67	315	8/19/94

FNOC4073	BLDG 702 - INSTALL SHELVES IN RMS 229, 1	5R00WA	0	49	57	20	70	113	309	7/13/94
220-5036	BLD 220- REPAIR PLASTER/PAINT BATHROOMS:	522963	0	3	9	7	190	98	307	11/18/94
221-4044	BLDG 221 PROVIDE /INSTALL DRAPES IN AVAT	522882	0	0	7	8	161	127	303	6/13/94
POMA5029	MOTHBALL 28 BUILDINGS ON FORT ORD.	5R51QA	0	11	6	24	75	184	300	11/25/94
220-4106	BLDG 220 - RE-CAULK 54 BATHTUB/SHOWERS I	522831	0	1	14	5	57	221	298	3/17/94
200-4009	BLDG 200 - MODIFY RM 108 FOR CAMERA EQUI	522922	0	61	48	39	102	44	294	7/14/94
330-5001	B330 - INSTALL BOLLARDS TO PROTECT DIESE	522978	0	7	10	6	96	171	290	12/5/94
43H-4220	380-A/B BERGIN - REPLACE SEWER DRAIN LIN	5R59HE	0	17	63	21	55	134	290	8/1/94
205-5000	BLD 205 RM 207 UPSTAIRS SHOWER - REPAIR	522960	0	3	9	19	57	198	286	11/18/94
245-5008	BLDG 245 - RELOCATE 2 BACKFLOW DEVICES I	522972	0	3	6	8	88	177	282	12/5/94
239-5003	BLD 239 - CLEAN WALLS AND PAINT (1) SQUA	522982	0	14	2	19	142	103	280	12/7/94
300-4006	BLDG 300 - CONSTRUCT A WALL STAND FOR A	522810	0	1	6	14	99	159	279	2/15/94
235-4056	BLDG 235 - CONSTRUCT WALL PARTITIONS IN	522914	0	29	11	21	140	72	273	8/4/94
245-5009	BLDG 245 - INSTALL SCREENS ON SEVEN (7)	522973	0	3	6	7	118	135	269	12/5/94
43H-5100	BLDG 187 - ENCLOSE LAWN MOWER AREA, INST	5R86HE	0	10	21	22	111	105	269	12/5/94
POM-5005	POM/B848-EAST EUROPEAN SCHL/SEC.A-REPAIR	5R51QA	1	15	0	29	62	161	268	10/17/94
POMA5061	POMA/BLDG 2075 - STILLWELL HALL - MOTHBA	5R51QY	0	127	8	18	85	25	263	1/10/95
43H-4236	INVESTIGATE/EVAULATE DAMAGE TO FLOOR STR	5R57HE	0	8	58	21	77	98	262	8/15/94
222-4016	BLDG 222 - RE-CAULK BOQ BATHTUBS	522813	0	2	10	17	42	186	257	2/16/94

FNOC5011	BLD 700 RM 159,175 AND 175A - INSTALL CO	5R10WA	0	50	7	33	8	159	257	11/17/94
POMA5018	INSTALL THROTTLE VALVE ON COE AV. WATER	5R95TA	36	127	6	6	45	35	255	11/14/94
220-5049	BLDG 220 - INSTALL A DUTCH DOOR IN ROOM	522984	0	0	14	34	141	64	253	12/21/94
DLI-4002	POM BLDGS 204/205/206/207 - INSTALL DRIN	5R51QA	0	37	19	14	176	4	250	9/13/94
235-4042	BLDG 235/RMS 200C & D,202,202A,B & C-INS	522879	0	34	8	20	139	43	244	4/28/94
234-5006	BLD 234 RM M2A/M2 - INSTALL DOOR BETWEEN	522212	0	48	9	7	82	90	236	12/28/94
DLI-4019	BLDGS 209,210,211 INSTALL METAL DOOR GUA	5R95QA	0	21	5	7	100	98	231	9/15/94
235-4065	BLDG 235 - INSTALL A 60 AMP CIRCUIT IN R	522933	0	19	32	19	114	47	231	9/7/94
GOLF5007	B191 -INSTALL POCKET DOOR AT GOLF COURSE	5R00WQ	0	40	5	39	42	103	229	1/27/95
236-4003	BLDG 236 - REPLACE SEWAGE LIFT PUMPS.	522901	0	0	4	2	170	49	225	8/11/94
220-4216	B220/RM 058-RESOLVE AIR FLOW/COOLING PRO	522207	132	8	5	8	36	36	225	9/21/94
POM-5045	BLD 228 - INSTALL 220 V 3-PHASE DROP	5R51QA	0	24	8	44	75	73	224	11/18/94
POM-5047	BLD 341 ADMIN AREA - CONSTRUCT WALL WIT	5R51QA	0	4	13	7	182	18	224	11/18/94
220-5058	BLD 221/RM 204 - REMODEL LAN SERVER ROOM	599220	0	54	6	14	87	60	221	1/12/95
245-5000	BLDG 245 - INSTALL BATTERIES AND HANG 11	522954	0	13	7	10	125	60	215	11/2/94
235-4057	BLDG 235 - EXTEND WALL IN RM 105 TO CEIL	522921	0	24	57	17	72	44	214	8/8/94
FNOC5027	FNOC MAIN GATE - REPAIR SIGN (STORM DAMA	5R13WA	0	0	17	10	106	80	213	1/20/95
221-4055	BLDG 221 - REPAIR HOLES IN CLOSETS IN BO	522926	0	6	75	16	83	31	211	8/11/94
220-5041	BLD 220 TRIDENT RM - INSTALL BOARDS	522214	0	3	120	34	32	20	209	10/21/94

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258-4003	BLDG 258 - INSTALL SELF CLOSING DOOR OR	522923	0	9	67	52	54	23	205	8/16/94
220-5020	BLD 220 QUARTERDECK - DESIGN AND MFG PHO	522952	0	7	13	10	132	42	204	10/26/94
235-4033	B235/RMS 200A & 200B- PROVIDE/INSTALL INT	522850	0	6	2	4	42	146	200	4/14/94
POM-5044	POM-TRANSFER 4KV DISTRIBUTION SYSTEM TO	5R51QA	0	81	7	8	62	42	200	11/17/94
DLI-4010	POM/BLDG 618 - INSTALL DIMMING LIGHTS IN	5R95QA	0	37	6	21	85	50	199	9/13/94
222-4021	BLDG 222 - REPAIR WINDOW LOCKS ON 1ST DE	522911	0	85	8	6	51	49	199	5/23/94
245-5004	BLD 245 RM 132 - INSTALL CONCRETE PAD	522969	0	17	4	112	17	49	199	11/18/94
43H-5069	B432(LA MESA HOUSING OFFICE)- REMOVE COUN	5R72HE	0	1	13	17	60	107	198	11/1/94
FNOC4063	BLDG 700 - INSTALL CONDUIT	5RR541	0	90	1	6	52	48	197	5/25/94
220-4200	BLDGS 220/221/222: INSTALL PEEP HOLES IN	522955	0	78	12	15	49	43	197	8/24/94
222-5010	MOVE CONTENTS RM 109/111 AND 114 TO RM 1	5R95YX	0	10	0	11	7	164	192	3/13/95
221-4059	B221/RM 106 - REMOVE WALL FOR INSTALLATI	522945	0	56	4	40	0	92	192	8/29/94
339-5006	BLD 339 ENTRY - REPAIR/REPLACE LOOSE TIL	522200	0	0	14	15	127	34	190	1/23/95
MISC4185	BLDG 187 - INSTALL SHOWER EYE/FACE WASH	522891	0	14	5	14	55	100	188	6/23/94
POMA5096	MANUFACTURE 7 SIGNS FOR VA CLINIC BLDG 3	5R51RP	0	11	69	24	34	50	188	3/17/95
FO-5001	FO BLD 4380 - INSTALL ONE 6' DOOR AND TW	5R51TA	0	13	20	9	123	23	188	10/6/94
221-5001	BLDG 221 - REPLACE TWO POST INDICATOR VA	522976	0	52	7	23	49	56	187	10/21/94
43H-5060	LA MESA 370-D/377D BERGIN - REPLACE FLOO	5R74HE	0	9	8	56	67	45	185	10/31/94

43H-5113	POMA - INSTALL MINI-BLINDS IN HOUSING AT	5R08QB	0	0	14	7	125	38	184	12/28/94
MISC4072	INSTALL A STORAGE SHED BY BLDG 288	522873	0	16	14	9	52	91	182	5/2/94
245-5005	BLDG 245 - INSTALL AIR/WATER LINES RMS 1	522966	0	10	5	9	36	118	178	11/21/94
STEM4002	BLDG 258 - REPAIR STEAM LEAK NEXT TO STE	522913	0	0	2	49	39	88	178	8/23/94
302-5009	ROOM 218 - INSTALL DOOR WITH CYPHER LOCK	522210	0	2	12	26	28	108	176	2/1/95
43H-5016	FABRICATE A COMPUTER CABINET FOR BLDG 43	5R75HB	0	41	12	16	43	64	176	10/6/94
245-5026	BLDG 245 - MODIFY ELEC IN RM 206/206A.	599239	0	34	12	8	97	24	175	3/9/95
220-4144	BLDG 220 - INSTALL SHELVES RMS: 200,204,	522876	0	9	6	7	43	109	174	5/17/94
232-5039	B232/RM 317 - INSTALL 2 OUTLETS AND FLUO	599247	0	43	5	20	65	41	174	3/23/95
339-4014	BLDG 339 - INSTALL BOARDS/PICTURES/TOWEL	522867	0	0	8	8	25	132	173	5/11/94
222-5018	BLDG 222 - RE-HANG 2 DOORS IN HALLWAY BE	5R95YX	0	2	12	4	88	65	171	4/3/95
300-4014	B300/CHAPEL - REPLACE DETERIORATED BELL	522927	0	0	80	16	20	55	171	8/12/94
235-4048	BLDG 235 - INSTALL WINDOW SCREENS IN ALL	522908	0	31	11	44	13	71	170	7/11/94
43H-5094	POMA 105 LEYTE - INSTALL RAMP AND BATHRO	5R05QB	0	1	14	22	92	41	170	11/29/94
POM-5204	POM/BLDGS 619,621 & 623 - MODIFY VENTILA	5R95QA	0	1	14	11	78	65	169	4/5/95
228-5000	BLD 228 INSTALL HANDRAILS EAST SIDE OF M	522937	0	7	15	17	72	58	169	10/6/94
43H-5135	43H POM - 322 FITCH - ROOF AND WOOD ROT	5R57QB	0	6	17	24	52	69	168	1/25/95
428-4002	BLDG 428 - CONSTRUCT A PAD FOR PROPANE T	522929	0	18	38	40	8	64	168	9/2/94
POM-5176	POM B-422 RM A1A- REMOVE SOUND	5R95QA	0	49	13	6	76	24	168	3/16/95

	BOARD TIL									
330-5005	BLDG 330 RM 369 CONVERT TO DISTANCE LEAR	599223	0	23	12	4	109	20	168	2/14/95
POMA5051	POMA T 4282 - REPAIR EXTERIOR WOODEN RAM	5R51TA	0	0	3	20	118	26	167	12/20/94
245-5029	BLDG 245/RMS 128B & 128C - INSTALL DIAMO	599240	0	43	5	6	49	62	165	3/9/95
43H-5258	POM 146 NOUMEA - REPAIR SIDEWALK	5R55QB	0	18	4	19	61	61	163	4/20/95
POM-5214	POM/BLDGS 634 & 636 - MANUFACTURE/INSTAL	5R95QA	0	0	13	11	86	52	162	4/12/95
MISC5001	REPAIR NPS PIER AT COAST GUARD MARINA	522957	6	14	8	51	47	36	162	11/1/94
220-5035	BLD 220- REPAIR/PAINT CEILINGS IN RMS: 2	522959	0	3	9	7	64	76	159	11/18/94
POM-5165	BLDG 281 - INSTALL LIGHTING IN BLDG	5R95QA	0	17	5	16	25	92	155	2/27/95
222-5000	BLDG 222 - INSTALL ICE MACHINE IN ROOM 3	522967	0	8	20	9	67	51	155	11/8/94
232-5049	B232 - MOVE CABINET/SINK/COUNTERTOP FROM	599263	4	31	22	10	62	24	153	4/13/95
POM-5081	POM BLD 341 - CONSTRUCT WALL WITH DOOR I	5R95QA	0	85	5	7	38	17	152	12/20/94
205-5003	B205 - REPAIR REPLACE TILE IN SHOWERS AN	599232	0	7	11	8	30	95	151	3/23/95
43H-5226	QUARTERS "M" - REMOVE WALL FAUCET & INST	5R15HE	0	18	6	5	76	45	150	4/3/95
POM-5014	RE-WIRE FOR TOWER LIGHTS ON HILLTOP FIEL	5R51QA	0	37	12	16	47	38	150	11/1/94
POM-5170	POM/B234-CONSTRUCT SIDE WALK AND 42" X 4	5R95QA	0	8	3	10	8	119	148	3/6/95
43H-5168	POM/327 FITCH - REPAIR/REPLACE PORCH RAI	5R57QB	0	13	8	2	54	71	148	2/14/95
43H-5077	LA MESA - 1106/1102 FARRAGUT - INSTALL L	5R77HE	0	18	11	10	67	42	148	11/3/94
43H-5217	POMA/205 SICILY-230 METZ-REPLACE UPLIFTE	5R55QB	0	8	15	11	31	81	146	3/28/95
514-5001	B514/BEACH LAB - REPLACE LIGHT	599260	0	19	15	13	50	49	146	4/28/95

	FIXTURES									
221-4045	BLDG 221-INSTALL 1-120V IN 504 AND 4-120	522898	0	43	4	1	43	54	145	6/15/94
43H-5288	201 SICILY - REPLACE SECTION OF SIDEWALK	5R55QB	0	13	28	7	35	61	144	5/9/95
43H-5290	222 ARDENNES - REPLACE SECTION OF SIDEWA	5R55QB	0	13	28	7	35	61	144	5/9/95
DLI-4021	364 ARMY ST/DLI - RECONSTRUCT FRONT PORC	5R95QA	0	7	23	19	59	36	144	9/26/94
FNOC5022	BLD 704 RM 117 - INSTALL (16) 4-PLEX OUT	5R15WA	0	34	9	19	61	21	144	1/12/95
POM-5094	POM 348 FITCH AVE - REPLACE KITCHEN FLOO	5R10QB	0	1	25	38	76	4	144	12/28/94
POM-5096	POM/B635-INSTALL ADDITIONAL ELECTRICAL O	5R95QA	0	24	44	6	51	17	142	12/30/94
220-4166	BLDG 220 - INSTALL "TRUMPET" CONE FOUNTA	522884	0	1	1	6	45	87	140	6/20/94
POMA5054	POMA BLD 4463 - REPAIR/REPLACE EXIT LIGH	5R51TA	0	41	4	29	34	31	139	12/30/94
220-5013	BLDG 220 - MOVE ICE MACHINES FROM THE SC	522962	0	28	12	14	79	6	139	10/21/94
POMA5030	HARD WIRE SMOKE DETECTORS IN BLDG 4402	5R51TA	0	10	1	9	83	35	138	11/25/94
POMA5095	REPLACE CEILING TILES IN STAIRWELL TO BA	5R95TA	0	12	5	15	42	63	137	3/17/95
223-5000	BLDG 223 SOUTH END - MODIFY 16 STEAM FIR	522975	0	49	6	23	26	31	135	10/25/94
POM-5079	POM BLD T-104/5/6/10 - SERVICE EXTERIOR	5R51QA	0	44	11	22	29	29	135	12/20/94
220-5019	BLD 220 RM 06 (EL PRADO RM) - INSTALL 12	522964	0	21	13	13	79	9	135	10/26/94
303-5005	BLDG 303 - REPLACE BROKEN MISSING CEILIN	599248	0	15	10	16	36	56	133	4/20/95
POMA5066	MANUFACTURE AND INSTALL 2 SIGNS PER ATTA	5R51TA	0	0	38	11	52	32	133	1/23/95
POM-5213	BLD 324 POM- REPAIR LEAK AND WATER	5R95QA	0	21	11	39	41	21	133	4/10/95

	DAMAG									
FNOC5111	B704 - INSTALL WATER LINE AND HOSE BIB T	5R29WA	0	13	14	19	28	58	132	5/4/95
POM-5106	POM BLD 234 - RENOVATION PER ATTACHED	5R95QA	0	32	87	0	13	0	132	1/13/95
348-5000	B348/REPLACE HYDRALIC FLUID IN AUTOMOTIV	599259	0	10	17	11	52	41	131	5/5/95
POMA5057	POMA/B4400-FABRICATE STAINLESS STEEL BRA	5RTB5C	0	11	21	4	70	23	129	1/9/95
220-4192	BLDG 220 - SECURE AND SOUND PROOF DOORS	522903	0	11	2	5	29	79	126	8/4/94
POMA5039	POMA BLD 4399 - REMOVE ALL DENTAL EQUIP	5R95QT	0	44	35	14	4	29	126	12/7/94
NRL-5001	RM 107/9/76 - 0UTLET AND CONDUIT FOR PHO	5R01YP	0	12	3	12	34	62	123	4/20/95
POM-5225	BLD 566 -REPLACE ACCESS RAMP, TOO STEEP	5R95QA	0	14	36	43	6	22	121	5/2/95
220-4180	BLDG 220 - MANUFACTURE AND INSTALL LEGAL	522896	0	6	2	11	77	22	118	7/14/94
POM-5211	POM/BLDG 636B - INSTALL (9) ELECTRICAL P	5R95QA	0	1	6	4	36	70	117	4/6/95
224-5002	B224/RM 101-FRAME IN WINDOW/PATCH HOLE I	599237	0	0	13	29	35	40	117	4/6/95
POMA5107	ORD VILLAGE LIFT STATION - REPLACE 20 FT	5R95TA	0	4	14	8	27	63	116	4/7/95
233-5004	RM 224 - INSTALL 120V 20A CIRCUIT	599235	0	32	7	4	20	53	116	3/6/95
43H-5287	208 SICILY - REPAIR SIDEWALK - C/432: RE	5R55QB	0	10	31	7	25	41	114	5/9/95
43H-5289	339 ARDENNES - REPLACE SECTION OF SIDEWA	5R55QB	0	13	28	7	25	41	114	5/9/95
43H-5291	202-206 SICILLY - REPLACE SECTION OF (2)	5R55QB	0	13	28	7	25	41	114	5/9/95
200-5006	INSTALL SHOWER EYE/FACE WASH STATIONS.	599258	0	5	17	7	19	65	113	5/10/95
220-5021	BLD 220 RM 074 - INSTALL (3) 4-TUBE FLOR	522950	0	5	6	17	75	9	112	10/28/94

POM-5146	POM/13 BLDS SEE ATTACHED-INSP/REPAIR FAU	5R95QA	0	22	6	1	29	53	111	2/14/95
POMA5119	POMA/BLDG 2237-REMOVE WINDBREAK, MOTHBAL	5R51QY	0	5	9	14	61	21	110	5/3/95
222-5011	B222/RMS 109 & 111-PATCH PAINT WALLS - R	5R95YX	0	64	1	6	30	8	109	3/13/95
POMA5038	POMA BLD 4275 - RELAMP FLOURESCENT LIGHT	5R51TA	0	20	7	15	36	29	107	12/7/94
POMA5037	POMA - MFG. SIGNS AND INSTALL PER ATTACH	5R51TA	0	28	6	7	44	22	107	12/7/94
POMA5146	POMA/INSTALL 4 TRAFFIC CONTROL SIGNS AT	5R95TA	0	0	16	31	24	35	106	6/7/95
220-5050	BLD 220 OUTSIDE WEST COMPRESSOR ALCOVE -	522988	0	2	13	1	67	23	106	12/27/94
302-4024	BLDG 302 - ADD 1" BYPASS PRV TO EXISTING	522912	0	30	8	6	21	40	105	7/18/94
POM-5114	BLD 627 - REPLACE/REPAIR 27 WINDOW LATCH	5R51QA	0	4	9	39	28	24	104	1/20/95
POM-5218	POM - REKEY BLD 566, CHILD DEVELOPMENT C	5R95QA	0	15	0	4	30	54	103	4/20/95
220-4183	B220-INST COAX CABLE BETWEEN GALLEON(045	522897	0	0	11	3	61	27	102	7/21/94
POM-5238	POM/B566 - WIDEN CONCRETE EGRESS FOR EVA	5R95QA	0	5	14	13	52	18	102	5/11/95
POMA5106	POMA/BLDG 4400 - INSTALL MAKO BREATHING	5R95TA	0	1	1	4	50	43	99	4/4/95
43H-5163	POMA/312 CARENTAN-REMOVE LEAD FROM EXT D	5R55QB	27	18	9	6	10	27	97	2/10/95
POM-5241	BLD 566 - INSTALL HOT WATER TANK WITH SE	5R95QA	0	13	22	5	16	40	96	5/17/95
POM-5168	INSTALL HEAT SHIELD OVER HEATERS & REPLA	5R51RD	0	14	10	0	13	54	91	3/6/95
POM-5244	POM BLD 215 - INSTALL (8) EMERGENCY LIGH	5R95QA	0	9	13	9	39	21	91	5/22/95
239-4006	BLDG 239-PERFORM INSPECTION GENERATED WO	522906	0	0	13	2	13	62	90	8/9/94

220-5022	BLDG 220 - INST. DRAIN FOR ROSE GARDEN	522953	0	1	13	10	24	42	90	11/1/94
222-5009	RM 089/100/101 - PREPARATION OF ROOMS FO	5R95YX	0	0	20	7	14	48	89	3/8/95
220-4191	BLDG 220 - REMOVE PLACARDS FROM WALLS IN	522905	0	1	17	1	0	69	88	8/4/94
222-4027	BLDG 222 - REMOVE PLARCARDS FROM WALLS I	522904	0	1	17	2	29	39	88	8/4/94
POM-5097	BLDGS: 354A, 356A, 358A/B INSTALL HARD W	5R51QA	0	9	4	23	12	38	86	1/4/95
228-5001	BLDG 228 - INSTALL CAGE IN STORAGE AREA	522217	0	7	6	19	21	31	84	2/9/95
POMA5125	POMA/INSTALL CABLE GATE AND SIGNS AT 8TH	5R95TA	0	6	10	12	31	25	84	5/9/95
GOLF5006	GOLF COURSE - REPAIR UNDERGROUND FIRE AL	522995	0	1	10	24	27	21	83	1/19/95
220-5073	B220/GALLEY - CONNECT STEAM OVEN TO DRAI	522213	3	3	12	22	42	0	82	2/3/95
POMA5078	REPLACE (2) PACO PUMPS AT GIGLING DR SEW	5R51QU	0	2	20	4	30	22	78	2/15/95
220-4190	BLDG 220 - INSTALL WALLS IN RM 060	5RRY95	0	9	1	4	29	34	77	8/2/94
POM-5184	REMOVE AND REPLACE ASBESTOS CEILING TILE	5R95QA	0	9	8	4	6	49	76	3/21/95
245-5039	INSTALL 3" PRESSURE REGULATOR ON BLDGS D	599256	0	0	15	6	29	26	76	5/17/95
233-5006	BLDG 243 - REPLACE 7.5 HP AIR COMPRESSOR	599229	0	5	8	6	23	32	74	3/23/95
MISC5044	REQUEST SIGNS FOR LAMESA VILLAGE ROLLER	5R07EL	0	0	7	3	12	43	65	7/18/95
43H-5099	BLD 187 - INSTALL 30' INFRA-RED HEATER I	5R79HE	0	2	5	1	7	41	56	12/5/94
234-5009	MOVE INTERNATIONAL PROGRAMS DEPT FROM BL	522202	0	2	0	0	2	49	53	1/30/95
MISC5048	MANUFACTURE 43 SIGNS PER ATTACHED FOR CO	599298	0	7	1	6	2	35	51	8/1/95
POMA5017	POMA REPLACE AIR SWITCH AND POLE	5R51TA	0	4	1	0	24	19	48	11/10/94

	(45"3)									
POM-5153	MANUFACTURE SUPPORTS TO HOLD PORTABLE PA	5R51QA	0	1	13	5	3	21	43	2/16/95
245-5016	B245/RM 146-BOLT DOWN TABLES IN TIERED C	522983	0	2	1	19	6	13	41	12/20/94
POM-5178	POM - MAKE (4) SIGNS FOR LANGUAGE DAY	5R95QA	0	3	3	6	7	21	40	3/17/95
245-5018	INSTALL 4 EA 1/2" COOLING LINES W/ 3/8"	522201	0	2	1	1	0	34	38	1/30/95
220-5037	BLD 220 EMCS DATA GATHERING PANEL - PROV	522968	0	8	3	4	2	13	30	11/28/94
POMA5085	REPLACE ALL AIRHANDLING FILTERS (EAST AN	5R95QV	0	2	1	0	0	21	24	2/28/95
		AVERAGES	3	24	15	16	62	66	184	
		STANDARD DEVIATION	24	50	18	16	52	61	106	
		VARIANCE	556	2515	306	268	2721	3685	11242	

APPENDIX E: WCMS DATA FOR COMPLETED FY96 WRs

PW_NUM	JOB_DESC	JON1	PE_A	PE_C	SHOP_A	MAT_O	MAT_R	SHOP_C	TOTAL	R_DAT
GRND3008	PROVIDE ASSISTANCE/MATERIALS FOR RESTORA	699656	0	0	0	299	86	425	810	8/6/93
MISC3126	AIS: BLDG 244 - REPLACE ROOF ON THE POOL	699946	401	0	6	49	8	307	771	9/21/93
43H-4218	398D RICKETTS-REPAIR MASTER BATH FLOOR	R5KGH	0	6	9	18	153	568	754	7/29/94
43H-5032	LA MESA - INSTALL "CHARLEY BARS" ON ALL	R5BGP	0	19	2	8	103	556	688	10/20/94
232-5004	BLD 232 - INSTALL CONDUIT FOR DATA CIRCU	699974	0	40	7	28	532	56	663	10/28/94
MISC4193	NPS - REPLACE STREET LIGHT POLE BASES ON	699918	0	56	36	20	207	335	654	7/28/94
FNOC4053	BLDG 702 - MODIFY ROOMS 12,13 & 14 FOR N	5R00YP	0	179	84	7	108	256	634	5/5/94
233-5002	BLDG 233 - EXTEND WALLS IN ROOMS 123/124	699989	0	263	4	5	121	239	632	4/21/94
DLI-4015	BLDG 627 - REPAIR/MAKE GALLEY BOILER OPE	6R56AE	0	13	29	42	93	429	606	9/14/94
43H-5111	QUARTERS B - N : INSTALL AUTOMATIC GARAG	R5HGH	49	7	19	2	65	460	602	12/28/94
GC-4008	GOLF COURSE AREA - INSTALL A ROOF OVER W	699916	0	44	135	54	188	162	583	5/2/94
300-4016	BLDG 300 - FABRICATE AND INSTALL CABINET	699226	0	190	6	8	57	297	558	9/14/94
POM-5078	POM BLDS 354/356/358 A&B - PAINT PORCHES	6R56AE	0	1	2	27	74	453	557	12/20/94
43H-5188	BLDG 345 - REPLACE TWO WORN (ZONE 2) DOM	R5EGL	0	9	5	23	385	98	520	3/6/95
220-4186	BLDG 220-REMOVE/RELOCATE SHELVING, RM 12	699351	0	473	0	15	1	20	509	7/28/94
POM-5012	POM/BLD 624-CENTRAL STAIRWELL - REMOVE S	6R56AE	0	2	1	22	80	394	499	10/24/94
235-4066	BLDG 235 - REPLACE WOOD DOOR IN ROOM 111	699932	0	1	50	11	191	244	497	9/7/94

POM-5201	BLDG 618 RM 20: CONSTRUCT A MINI-RECORDI	6R56AE	0	162	1	6	258	63	490	4/5/95
POM-5066	POM RIFLE RANGE ROAD - REPAIR/REPLACE ST	6R56AE	0	57	146	28	110	141	482	12/7/94
220-4205	BLDG 220 - INSTALL DUTCH DOORS IN RM 142	699917	0	29	31	353	0	64	477	8/29/94
232-5003	BLD 232 RM'S 439B, C & D - INSTALL 115V	699288	0	258	21	9	152	29	469	10/21/94
514-5002	B514/BEACH LAB - REPLACE ALL WINDOW GRAT	699266	0	7	16	17	65	357	462	5/17/95
232-4042	BLDG 232-DISCONNECT & REMOVE FUME HOODS,	699998	0	166	12	14	93	161	446	8/5/94
POM-5245	POM/B645-652-INSPECT/REPAIR ALL BOILER R	6R56AE	0	128	29	12	107	167	443	5/22/95
FO-5004	POM BLD 622,630,646 THRU 652,831 THRU 83	5R95QA	0	8	12	343	9	67	439	10/6/94
POMA5109	FABRICATE 100 SILK SCREEN SIGNS FOR BLM	6R56AJ	0	14	325	13	56	26	434	4/10/95
ANNX5001	ANNEX/BLDG 11 - PREP & PAINT EXTERIOR	699980	0	15	7	3	185	219	429	11/30/94
POM-5183	POM/BLDG 276 - REMOVE CLOSET AND REFIT R	6R56AE	34	197	72	49	0	70	422	3/21/95
POM-5136	POM - PLACE WOODEN SLATS (SKIRT) AROUND	6R56AE	0	2	335	5	20	57	419	2/8/95
POM-5127	POM/POMA - MAKE SIGNS PER ATTACHED		0	0	49	1	16	333	399	1/31/95
POM-5216	POM/BLDGS 645B,646A & 646B-REPAIR ROOF L	6R56AE	0	18	11	19	48	303	399	4/13/95
436-5003	INSTALL EMERGENCY SPILL VALVE IN TRANS C	699992	0	27	11	160	122	79	399	12/16/94
FNOC5102	FNOC/700 & 702-INSTALL E.M.T., & LOCKING	6R56TA	92	123	51	0	16	116	398	1/25/95
220-5097	BLDG 220 BACK DOCK-REPLACE DETERIORATED	699225	0	5	8	8	99	262	382	3/9/95
FNOC5160	FNOC/B25-REMOVE FLAKING LEAD BASED PAINT	6R56TA	15	0	36	28	26	270	375	8/28/95
FNOC5014	BLDG 702 - INSTALL POWER AND	6R56TA	0	113	9	4	121	119	366	12/5/94

	POWER PANEL									
POMA5069	POMA BLD 4275 (LIBRARY) - INSTALL HAND R	6R56AJ	0	6	143	32	66	94	341	1/24/95
POM-5056	POM B-648 & 652 - TEST SPRINKLER SYSTEMS	5R95QA	0	12	8	107	61	148	336	11/30/94
GRND5020	MAKE SIGN FOR ENTRANCE TO NPS BEACH PROP	699286	0	153	19	9	34	117	332	2/2/95
POM-5262	BLD 341 - INSTALL HANDICAP ACCESS TO FRO	6R56AE	0	32	56	7	18	217	330	6/5/95
POMA5077	POMA/BLDG 4280-INSTALL EMERGENCY EXIT FI	5R51RJ	0	29	105	33	47	111	325	2/9/95
POM-6003	POM/336 FITCH AVE - REPAIR/REMODEL HOUSI	6R56BF	0	7	104	10	25	176	322	10/4/95
POMA5087	POMA/BLDG 4235(POST EXCHANGE) - REPLACE	5R51RR	0	32	56	24	112	98	322	3/27/95
POM-5125	POM/BLDGS 366 & 367 - INSTALL EMERGENCY	5R51RH	0	43	100	20	65	94	322	1/31/95
220-5134	B220/RM 433 - REPLACE DENTAL CLINIC SHAL	699279	1	5	29	16	20	249	320	6/15/95
POMA5187	POMA: 939 WALLEY CT. - REPAIR WATER DAMA	6R56BF	0	25	140	9	29	114	317	8/17/95
FNOC5016	B702/RM 14 - FABRICATE, PAINT AND INSTAL	5R12WA	0	18	14	16	176	90	314	12/22/94
232-5024	PREP AND REFINISH ALL WOOD RAILINGS (INC	699204	0	5	6	1	21	280	313	1/27/95
43H-5191	LA MESA/1101 FARRAGUT/COMMUNITY CENTER-C	R5AGP	0	44	7	16	80	166	313	3/6/95
POMA5046	POMA/B7693-INST DOOR W/LITES(4 BATHRMS)	5R95TA	0	65	126	28	47	44	310	12/19/94
220-5098	BLDG 220 SUB BASEMENT - REPLACE 7 EA 4"	699224	0	2	7	8	70	219	306	3/13/95
302-6000	B302/RESOLVE EXCESSIVE INTERNAL POTABLE	699348	0	2	19	21	49	209	300	10/3/95
POMA5194	4TH AVE AND 12TH ST. - INSTALL A 45FT CL	6R56AJ	0	21	115	31	128	5	300	8/22/95
232-5038	B232 - INSTALL DOOR BETWEEN RM	699330	0	153	50	34	26	33	296	3/23/95

	350A-352									
POMA5060	POMA/B2837 - REPAIR INT. AND EXT. WALL D	6R56AG	0	8	156	32	35	64	295	1/10/95
POM-5281	POM/B263 - REPLACE DOOR, FRAME AND LOCKS	6R56AE	0	5	27	7	200	53	292	6/15/95
POM-5113	POM BLD 276 RM10/12 AND BASEMENT - INSTA	5R51RA	0	41	43	6	141	56	287	1/18/95
POMA5221	BLDG 4280 - REPLACE TRANSFORMERS, X-ARMS	6R56AJ	0	37	74	24	137	15	287	9/16/95
POMA5136	POMA/BLDG 4974 - REPAIR WATER PUMPS AND		0	14	80	7	38	141	280	5/30/95
POM-6008	BLDG. 631 - 637 INSTALL ADDITIONAL PHOTO	6R56AE	0	25	25	47	42	139	278	10/12/95
POMA6006	ABRAMS HOUSING - LOCATE/REPAIR DIRECT BU	6R56AJ	0	48	36	7	20	166	277	10/13/95
POM-5261	POM/B454-INSTALL GFI,RANGE HOOD,EMERGENC	6R56BE	0	21	17	11	200	26	275	6/5/95
245-5056	RMS 221/222/223 - CONNECT WATER/DRAINS/E	699317	0	102	18	0	22	125	267	6/12/95
POM-6072	POM/B842-REPLACE BATTERIES FOR THE EMERG	6R56AE	0	31	8	27	119	79	264	12/18/95
220-6005	B220/COM GALLEY HALLWAY - INSTALL DEEP S	6R56UB	0	1	12	16	55	179	263	10/10/95
POM-5333	POM/B233-BUILD SIDEWALK FROM SIDE TO ENT	6R56AE	0	16	56	-3	46	145	260	8/14/95
POM-5228	INSTALL DEDICATED OUTLETS TO ELETRONIC E	R95QA	0	7	21	8	83	141	260	5/2/95
POM-5287	POM/B234-REPAIR/REPLACE EXIT & EMERGENCY		0	19	14	43	50	133	259	6/21/95
232-5050	B232/RMS 543,545 & 548 - REINSTALL APPRO	699257	0	28	14	6	13	194	255	4/20/95
245-5031	B245/ANCHOR TABLES TO GROUND AND SUPPLY	699271	0	49	19	38	87	62	255	4/20/95
POM-5130	POM BLD 630A - RMS:357/369/373 - REPLACE	5R51QA	0	7	6	2	36	201	252	1/31/95
220-5161	B220/MAIN GALLEY - REPLACE SUB	699307	0	3	6	7	21	209	246	8/28/95

	BASEMENT									
POMA5113	POMA/B4283-INSTALL REMOVABLE SAFETY RAIL	5R95TA	0	20	20	8	22	173	243	4/20/95
POMA5130	REPLACE KITCHEN DOOR WITH FIRE SAFETY DO	5R51TC	0	20	48	7	46	120	241	5/17/95
POM-5247	BLD 619/621/623 - RESEAL LATRINE FLOORS	5R95QA	0	1	29	6	175	27	238	5/24/95
POM-6052	POM/BLDG 614 - REMODEL OFFICES FOR PROTO	R56AE	0	1	20	22	41	153	237	12/5/95
258-5008	INSTALL 12" TURBINE VENTILATOR IN STEEL	699292	0	14	11	10	8	193	236	7/6/95
POM-5318	POM/B235 - INSTALL EMERGENCY LIGHTING	6R56AE	0	55	30	1	69	81	236	8/2/95
232-5071	MOUNT DATA CONDUIT IN COMPUTER SCIENCE D	699299	0	61	10	10	22	132	235	6/8/95
MISC5019	CLEAN, PAINT, STENCIL WARNINGS ON ALL MA	5R19HE	0	0	12	92	20	105	229	5/4/95
POMA5137	BLDG 4974 - REPAIR WIRING IN CONTROL PAN	5R95TA	61	3	16	12	47	89	228	5/30/95
239-5004	B239 - REPLACE LIGHT FIXTURES WITH TOP A	699287	0	85	6	12	51	72	226	4/24/95
POMA5115	POMA/HOUSING/539 WARRELLMAN CT - REPAIR	5R95TA	0	91	35	11	20	69	226	4/24/95
POMA6010	FITCH PARK - INSTALL (39) TRAFFIC SIGNS	6R56AJ	0	4	143	13	29	37	226	10/19/95
200-6000	CONSTRUCT AND INSTALL CUSTOMER ASSISTANC	699364	0	70	41	7	24	81	223	9/20/95
232-6016	B232/FROM RM 240 TO RM 238 & 242 - EXTEN	699385	0	84	21	8	44	66	223	12/19/95
POM-6103	POM/B228 - REPAIR EXIT LIGHTING & INSTA	6R56AE	0	49	24	21	39	89	222	1/29/96
POMA5188	B-4403/4400: REPAIR ROLL UP DOOR MOTORS	6R56AF	0	19	98	2	43	59	221	8/17/95
232-5070	B232 - REMOVE WALL MOUNT DATA CONDUITS F	699290	0	42	11	14	37	115	219	6/8/95
STEM5000	NEXT TO B224 - REPAIR & REINSULATE	699294	0	1	6	35	17	158	217	7/25/95

	STEAM									
223-5002	INSTALL TEMPORARY WALL WITH 36" DOOR WIT	599252	0	21	17	8	72	90	208	4/7/95
235-5021	B235/RM 122 - INSTALL FLOOR-TO-CEILING P	699275	0	28	13	1	99	62	203	5/17/95
234-5039	B234 - FABRICATE/INSTALL DRAIN COVER & I	699358	0	13	2	5	45	137	202	11/28/95
FNOC5100	B702/RMS 232, 234 & 235 TRIM OUT INTERIO	5R25WA	0	13	14	12	18	144	201	3/23/95
POMA5100	POMA/B2248-INSPECT/REPAIR ROOF.FLOORS TO	5R51QY	12	35	9	13	28	104	201	3/23/95
POM-6110	POM/B276 - INSTALL ADDITIONAL ELECTRICAL	6R56AE	0	30	12	8	66	82	198	2/5/96
302-5019	B302/RMS 102 & 109 - RELOCATE TIMER SWIT	699296	0	64	14	6	9	104	197	5/23/95
43H-6025	POMA/325 BRITTANY-REPAIR DAMAGED ROOF &	6R56BE	0	8	14	34	42	98	196	1/2/96
POMA5216	POMA/B4399 - INSTALL EXIT SIGNS/RELAMP/I	6R56AJ	0	30	16	31	105	14	196	9/11/95
MISC5026	1352 LIGHT HOUSE AVE PG - TEST/REPAIR/CE	5R53ZR	34	2	80	9	13	57	195	4/20/95
POM-5314	POM/B418 - MAIN ENTRY/INSTALL BUZZER	5R95QA	0	10	17	11	116	41	195	8/1/95
POMA6050	POMA/B4403-CONNECT BLDG TO EMERGENCY POW	6R56AJ	0	48	30	27	43	44	192	2/27/96
235-5027	B235/RMS 200C-204 ADD/REDISTRUBUTE CIRCU	699309	0	37	19	2	54	79	191	7/12/95
FNOC6041	BLD 702 RM 280 - INSTALL AN EXHAUST FAN	6R56TA	0	16	17	8	66	82	189	2/14/96
POM-5222	POM/BLDG 418 - CONSTRUCT TELE CONFERENCI	5R51RK	0	4	1	0	61	122	188	4/20/95
POMA5139	POMA HOUSING - REPLACE DEFECTIVE 50KVA T	5R95TA	0	50	20	9	65	40	184	6/5/95
POMA5114	BLD 7693 - INSTALL DOORBELL	5R95TA	0	30	49	14	51	40	184	4/24/95
FNOC6036	B702/RM 02 - INSTALL (8) 20AMP OUTLETS	6R56TA	0	49	3	18	65	48	183	2/6/96

302-5025	B302 - INST CEILING TILES IN BASEMENT, R	699280	0	0	14	19	41	104	178	7/6/95
WATR6003	REPLACE INOPERATIVE 4" & 12" GATE VALVES	699389	0	58	9	20	29	59	175	2/5/96
43H-5333	POMA HOUSING/ 156 NOUMEA - REPLACE SIDEW	5R55QB	0	39	29	3	27	76	174	6/15/95
235-5025	B235/RM 117A - RECONFIGURE LIGHT SWITCHI	699293	0	35	11	5	58	65	174	6/15/95
POM-5224	POM/B627/SOUTH BASEMENT - INSTALL DROP C	5R95QA	0	12	25	7	41	87	172	7/12/95
POM-5349	POM - REPAIR WATER LEAK ON MAIN LINE BY	6R56AE	0	0	62	27	19	63	171	8/25/95
POMA6009	REPLACE POLE MOUNTED TRANSFORMER - 12KV	6R56AJ	0	5	73	24	51	13	166	10/19/95
POMA6028	POMA-REMOVE/INSTALL 50KVA 12KV 120/240V	6R56AJ	0	36	22	13	84	10	165	1/16/96
FNOC6056	BLDG 704- INSTALL 40 AMP ELECTRICAL SERV	6R56TA	0	43	10	29	51	30	163	3/28/96
POM-6054	POM/B517-INSTALL (5) EMERGENCY EXIT SIGN	6R56AE	0	33	8	16	41	63	161	12/7/95
220-5173	STAIR CASE TO SUB-BASEMENT - CLEAN, CONS	699347	0	6	22	44	49	40	161	9/26/95
232-5076	B232 - EXIT FROM RM 101A - REPAIR STEP A	699282	0	2	6	13	48	91	160	7/12/95
245-5062	B245 - INSTALL CONTROL PANELS IN PROPULS	699324	0	27	37	6	40	47	157	8/9/95
POM-5356	POM - REMOVE H.V.LINES & POLE TRANSFORME	6R56AE	0	8	37	49	43	17	154	9/11/95
FNOC6063	BLDG 700 RM 156, 157, 159-INSTALL 21 NEW	6R56TA	0	43	9	24	38	38	152	4/8/96
POMA5128	REPLACE TRANSFORMER AT 114 ATTU ST POMA	5R95TA	0	33	47	23	27	21	151	5/12/95
43H-6029	LA MESA/B187-REPAIR/REPLACE ROOF ON FLAM	699375	0	17	8	8	23	94	150	1/19/96
POM-6078	POM/B216 - REPAIR/REPLACE DOORS ON ROOMS	6R56AE	0	7	16	42	53	32	150	1/3/96

POM-5307	POM/B234 - PAINT RAMP TO ENTRANCE DOORS,	5R95QA	0	0	25	8	26	89	148	7/24/95
PTSR6001	PT SUR-REMOVE UNUSED UTILITY LINES FROM	6RGW6H	0	35	58	10	8	36	147	3/13/96
235-6008	B235 - INSTALL NEW ELEC. SERVICES TO THE	699367	0	41	8	7	48	41	145	12/7/95
FNOC6051	BLDGS 702 AND 704-INSTALL NON-SKID MATER	6R56TA	0	1	9	13	89	29	141	3/19/96
302-5022	B302/RM 016-DISCONNECT/REMOVE ELEC CONNE	699273	0	0	12	74	1	53	140	6/14/95
245-5048	B245/RM 237- MOUNT ELEC.FURNACE,INSTALL	699281	0	15	23	19	44	34	135	6/12/95
POMA6020	POMA/B7693 - INSTALL (4) NEW DOORS FOR L	6R56AE	0	15	2	9	51	57	134	1/3/96
POM-6079	POM/B276 BASEMENT- REPAIR WINDOW SILLS A	6R56AE	0	29	6	33	43	23	134	1/3/96
POMA5173	POMA/HOUSING-REPAIR SIDEWALKS AT FOUR(4)	5R95TA	0	25	13	8	13	69	128	7/31/95
POM-6139	POM/327 FITCH-INSTALL FLOORING IN ATTIC	6R56AE	0	46	53	10	3	16	128	2/22/96
POM-6104	POM/B621 & 623 - REPAIR WINDOW LOCKS & R	6R56AE	0	24	4	2	29	65	124	1/29/96
POM-6201	327 FITCH-INSTALL A DOOR AT HEAD OF STAI	6R56AE	0	16	8	10	56	33	123	5/7/96
WATR6001	NPS/REPLACE INOPERATIVE 6" GATE VALVE IN	699368	0	14	1	7	42	57	121	1/16/96
222-5035	BLDG 222 - REPLACE HEAT EXCHANGER	699305	0	1	10	15	9	76	111	8/17/95
FNOC6060	B700 - P.W. ELECTRICAL SUPPORT FOR ANNUA	6R56TA	0	25	7	3	54	21	110	3/28/96
MISC6051	PROCURE/ASSEMBLE AND PLACE 6 PIC-NIC TAB	699399	0	1	6	8	74	19	108	5/22/96
43H-6001	QTRS "E" - REMOVE CASING, REINSULATE STE	699344	0	6	7	6	35	46	100	10/5/95
POMA6048	POMA HSG/STILLWELL & MARSHALL PARKS-LOCA	6R56BE	0	4	36	12	15	32	99	2/23/96
MISC6057	INSTALL SHELVING IN 8 RMS AT 1280	699409	8	0	4	0	28	47	87	6/12/96

	LEAHY									
220-6031	B220-INSTALL NEW LAVATORY SINK FAUCETS &	699377	0	8	7	2	33	35	85	2/5/96
POM-6080	POM/B218 - REPAIR EXTERIOR WALL AND (2)	6R56AE	0	12	7	10	13	39	81	1/4/96
POM-6086	327 FITCH - REPAIR (12) ITEMS SEE ATTACH	6R56BE	0	1	5	7	38	24	75	1/10/96
43H-6004	QTRS "A" - INSTALL 2 CATCH BASINS AND 24	6R56FM	0	2	7	7	39	20	75	10/17/95
POM-6199	327 FITCH-UPGRADE INTERIOR ELECTRICAL WI	6R56AE	0	16	8	6	7	33	70	5/7/96
POM-6195	327 FITCH-REPAIR/REPLACE FLOORING IN STO	6R56AE	0	15	9	10	3	33	70	5/7/96
220-6022	FABRICATE AND INSTALL WINDOW SCREENS IN	699363	0	4	7	1	7	49	68	12/29/95
301-5003	BLDG 301 - TAPE NEW SHEET ROCK, PRIME AN	699308	0	0	0	9	1	47	57	9/5/95
220-6101	BLDG 220: INSTALL MISC HARDWARE/PAINT RE	699398	0	2	5	1	12	36	56	5/21/96
MISC6055	1280 LEAHY (FSC) - REPLACE LOCKS & REKEY	699401	0	0	0	23	5	28	56	6/3/96
220-6074	B220/SUB-BASEMENT-REPLACE WORN EXHAUST F	699391	0	1	0	3	4	43	51	4/11/96
MISC6060	PROVIDE NEW SIGNS FOR FAMILY SERVICE CEN	699412	0	0	2	15	13	21	51	7/1/96
236-6000	B236 - REMOVE ASBESTOS FROM BOILERS #1,	699349	0	0	1	0	0	42	43	10/24/95
PLOT6000	REPAIR SINK HOLE IN LOT "K". SEE DAVE TE	699362	0	5	0	0	6	22	33	12/15/95
		AVERAGES	4	35	32	23	61	115	271	
		STANDARD DEVIATION	33	59	48	47	67	109	162	
		VARIANCE	1108	3433	2292	2240	4484	11810	26144	

APPENDIX F: WCMS DATA FOR COMPLETED FY97 WRs

PW_NUM	JOB_DESC	JON1	PE_A	PE_C	SHOP_A	MAT_O	MAT_R	SHOP_C	TOTAL	R_DAT
43H-4201	INSTALL A DRINKING FOUNTAIN AT BERGIN FI		0	7	603		72	912	1004	7/12/94
FNOC4093	BLDG 702 - REPLACE CEILING TILES IN BLDG	7R57TA	0	31	53	19	55	731	889	9/2/94
POM-5072	POM BLD 618 - CONSTRUCT OFFICE AND STORA	7R57AC	344	109	6	1	182	174	816	12/8/94
POM-5126	POM/B645B,646A/B,647A/B,648B-REPIN LOCKS	7R57AC	0	1	374	2	135	244	756	1/31/95
302-5026	B302-REKEY ALL NSA OFFICES - 46 LOCKS AN	799742	0	5	29	6	203	339	582	7/6/95
43H-5314	POMA/184 CORREGIDOR-REPAIR LEFT SIDE OF		0	79	49	34	27	348	537	6/5/95
43H-6043	POM/B552,553 & 559-REPLACE STORAGE ROOM	7R57BE	0	19	22	15	37	283	376	2/21/96
43H-6071	POM/B550-563 BUILD (5) STORAGE LOCKERS	7R57BE	0	21	31	25	120	138	335	4/2/96
245-6006	B245 RM 205-INSTALL 4 POLISHING BENCHES	799742	88	7	11	25	163	22	316	3/28/96
POM-6148	POM/B627-INSTALL DROP CEILING AND FLUORE	7R57AC	0	15	23	22	56	188	304	3/11/96
43H-6113	INSTALL TRENCH DRAIN IN LOW AREA AT 204	R57BE	0	47	78	5	41	118	289	5/31/96
POM-6188	POM/B517 - REPAIR BUILT-UP BEAMS (FLOOR	7R57AC	0	3	6	33	136	90	268	4/29/96
211-6009	INSTALL ELECTRIC/WATER METERS & WATER PR	799722	0	3	83	7	146	9	248	6/4/96
245-6013	CORRECT CONDENSATION PROBLEMS ON PNEUMAT	799742	0	38	77	4	22	95	236	7/23/96
43H-6184	332 FITCH-PERFORM MOVE OUT MAINTENANCE,	7R57BE	0	0	2	4	64	117	187	8/22/96
POM-6585	BLDG 367 - INSTALL HARD WIRE SMOKE DETEC	7R57AC	0	15	6	19	36	77	153	7/3/96
GOLF7004	GOLF COURSE-EXTEND EXISTING	799722	0	4	49	29	23	31	136	10/31/96

	POWER SUPPLY									
HOUS7009	336 FITCH-INSTALL NEW COUNTER TOPS	R57BE	0	7	4	1	9	98	119	10/11/96
POM-7056	BLDG. 621 & 623-REPAIR WINDOWS LISTED IN	7R57AC	0	41	9	7	32	25	114	12/18/96
232-7031	RM 009 - INVESTIGATE/SOLVE STEAM VAPOR &	799742	0	0	7	0	62	5	74	1/9/97
211-7003	RE-KEY CRICUOLO HALL, BLDG 211, PER ATTA	7RPH6B	0	1	0	17	6	40	64	12/23/96
		AVERAGES	21	22	72	14	77	194	372	
		STANDARD DEVIATION	77	28	145	11	61	234	282	
		VARIANCE	5860	805	21144	130	3690	54811	79774	

APPENDIX G: ESMS DATABASE SAMPLE PRINTOUT

	CONTINUES TO RUN WATER. 40-10		
098562	LIGHT SWITCH IS BROKEN.	10/28/96	10/29/96
098564	LIGHTS WON'T WORK. SWITCH SPARKS. DISPATCHED 40-22.	10/28/96	10/29/96
098568	DOOR HANDLE OF LOCK SET FELL OFF. DISPATCHED 40-16 1405hrs.	10/28/96	10/29/96
098408	REPAIR, RECAULK, WINDOW ABOVE THE EXIT DOOR.	10/22/96	10/29/96
098360	DOOR KNOB WILL NOT TURN AT CERTAIN TIMES. NEED TO JUGGLE	10/18/96	10/31/96
098452	MOUNT A 40" x 30" WHITE BOARD TO THE CORRIDOR WALL	10/23/96	10/31/96
098454	DOOR HANDLE FELL OFF.	10/24/96	10/31/96
098461	INSTALL A 2FT X 3FT SCHEDULE BOARD IN THE BLDG 232 RM#SP257	10/24/96	10/31/96
098480	NEED THREE (3) COPIES OF THE FOLLOWING KEYS MADE	10/24/96	10/31/96
098512	WEST SIDE, BUILDING ENTRY DOOR, SLOAT ST. APPROACH;	10/25/96	10/31/96
098541	LOCK SET FELL OUT. CALLER HAS PARTS IN ROOM 341.	10/28/96	10/31/96
098544	WINDOW WILL NOT CLOSE.	10/28/96	10/31/96
098547	RESET STEAM REGULATOR. NO FOLLOW UP REQUIRED FROM 10-23-96.	10/28/96	10/31/96
098548	CLOGGED TOILET. NO FOLLOW UP REQUIRED. M.POTTS/321. 10-24-96	10/28/96	10/31/96
098552	NO HEAT. SCHREADER/CLARK RESTORED AS PER POTTS/321, 10-26-96	10/28/96	10/31/96
098566	CUSTOMER NEEDS KEYS FOR NEW LOCK SET. 40-17.	10/28/96	10/31/96
098575	WATER IS LEAKING THROUGH WALLS AND CEILING. 40-12	10/29/96	10/31/96
098576	RELAMP AS REQUIRED. 40-8.	10/29/96	10/31/96
098577	RELAMP AS REQUIRED. 40-8.	10/29/96	10/31/96
098578	B260 - PROVIDE TWO(2) PADLOCK KEYS	10/29/96	10/31/96
098579	WATER IS LEAKING ON AN ELECTRICAL OUTLET AT PRESSURE COOKER.	10/29/96	10/31/96
098587	REPLACE LOCKSET AS REQUIRED. 40-17.	10/29/96	10/31/96
098594	ASSEMBLE 2 CHAIRS FOR F.S.C. @ LA MESA PRIOR TO 1200 hrs ON	10/29/96	10/31/96
098636	REPLACE LEAKING VALVE.	10/30/96	10/31/96
098210	WATER FOUNTAIN NOT WORKING	10/10/96	11/1/96
098271	REPLACE INOP LIGHT BULBS IN BASEMENT HALLWAYS, BETWEEN	10/15/96	11/1/96
098328	REPLACE CEILING VENT GRILL COVER, WOMENS RESTROOM.	10/17/96	11/1/96
098394	NO HEAT IN THE BASEMENT OF BLDG 302.	10/21/96	11/1/96
098396	NO HEAT IN BLDG 203.	10/21/96	11/1/96
098416	HOLE IN WATER HEATER.	10/22/96	11/1/96
098429	GAS LEAK, NO HEAT.	10/23/96	11/1/96
098433	REMOVE SHELVING IN RM 261, SEE REQUESTOR FOR INSTRUCTION	10/23/96	11/1/96

098417	LIGHT OUT IN SQUASH COURT.	10/22/96	10/28/96
098418	RELAMP LIGHT BY DOOR TO ROOM 115	10/22/96	10/28/96
098426	RELAMP 4 FLOURESCENT LIGHTS.	10/23/96	10/28/96
098427	LADIES REST ROOM BY PICNIC AREA, TOILET FLUSHING CONSTANTLY	10/23/96	10/28/96
098430	LIGHTS OUT. HALLWAY AND WEIGHT ROOM.	10/23/96	10/28/96
098431	LIGHTS OUT IN MEN'S LOCKER ROOM. SEE FLETCHER!	10/23/96	10/28/96
098436	NO HEAT, THERMOSTAT NOT WORKING.	10/23/96	10/28/96
098445	LIGHT SWITCH HAS LOOSE WIRES, LIGHTS FLICKER.	10/23/96	10/28/96
098453	REKEY PADLOCK	10/23/96	10/28/96
098455	SINK STOPPED UP	10/24/96	10/28/96
098203	UNLOCK DESK DRAWER	10/10/96	10/28/96
098215	REMOVE DEBRIS FROM ACCIDENT.	10/11/96	10/28/96
098259	INSTALL LOCKING DOOR KNOB TO INTER OFFICE OF THIS ROOM.	10/15/96	10/28/96
098286	THE 3RD SET OF DOUBLE DOORS FROM LEFT SIDE, THE RIGHT SIDE	10/16/96	10/28/96
098305	CHANGE COMBINATIONS ON SAFE.	10/16/96	10/28/96
098458	WATER FROM CEILING DRIPPING ON EQUIPMENT.	10/24/96	10/28/96
098459	DOOR NEEDS A DOOR STOP INSTALLED, THEY WOULD LIKE DOOR TO	10/24/96	10/28/96
098502	REQUEST TO MOVE (1) DESK AND (1) PICTURE FRAME FROM SUPPLY	10/24/96	10/28/96
098503	REQUEST THAT FENCE AND THE GAP UNDER THE FENCE AT THE NPS SO	10/24/96	10/29/96
098423	FLOURESCENT LIGHTS OUT.	10/23/96	10/29/96
098474	PANEL "MB"S 100A 3P CB'ER IF POSSIBLE NEEDS TO BE REPLACED W	10/24/96	10/29/96
098481	TO REPAIR A BROKEN HINGE ON UPER PART OF BACK DOOR INSIDE	10/24/96	10/29/96
098485	CEILING LIGHT IS INOP AND NEEDS TO BE RELAMPED.	10/24/96	10/29/96
098487	REPAIR THE FOLLOWING EXIT LIGHTS.	10/24/96	10/29/96
098499	NEED TO RELAMP (6 LONG/8 SHORT) FLOURESCENT LIGHTS.	10/24/96	10/29/96
098501	REPOSITION MOTION DECTECTOR ON CEILING TO COVER MOVE AREA AT	10/24/96	10/29/96
098504	CEILING LEAKING/THEY HAVE GARBAGE CAN IN HALLWAY.	10/24/96	10/29/96
098509	RELAMP AS PER CALLER'S REQUIREMENTS. 40-8 1030 hrs	10/25/96	10/29/96
098517	CUSTOMER HAS NO LIGHTS EXCEPT FROM WINDOWS.	10/25/96	10/29/96
098525	GOLF COURSE, PICNIC GROUNDS; NO POWER. 40-8.	10/25/96	10/29/96
098529	PODIUM w/PA SYSTEM, PLATFORM TO SEAT 12 AND 150 FOLD CHAIRS	10/25/96	10/29/96
098545	RELAMP AS REQUIRED.	10/28/96	10/29/96
098560	PLEASE UNPLUG SINK. 40-10	10/28/96	10/29/96
098561	2nd FLOOR LADIES ROOM COMMODE	10/28/96	10/29/96

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